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TESTING THE GERMICIDAL POWER OF VARIOUS PRODUCTS BY THE THREAD METHOD (Dried Cultures Method).

By A. SHERIDAN DELÉPINE, M.Sc., M.B.,
Director of the Public Health Laboratory, University of Manchester.
(FELLOW.)

R. Koch's Thread Method.

THE thread method which I have used since 1892 differs from that employed in the experiments published by Koch in 1881, the only common features between the two being that threads impregnated with bacteria are used for the purpose of testing disinfectants. Koch used threads loaded with anthrax spores; these were left for various lengths of time in the solution to be tested, washed, and then placed in nutrient gelatine or used for inoculating animals. The germicidal value was estimated by the duration of the exposure necessary to cause the death of the spores.

Owing probably to an impression that only sporing organisms were suitable for the application of this method, it appeared to most observers that its use was very limited. In 1892 I made a series of experiments to ascertain how far non-sporing organisms could be used instead of anthrax spores, and found that with most pathogenic organisms it was possible to prepare threads which could be kept for a considerable time without the bacteria losing their power of growing actively. For certain purposes I used small square pieces of pure filter paper instead of threads, but for general work silk threads are more convenient. This method has been used regularly in my laboratory for some fifteen years, and during that time I have not found it necessary to modify it except as regards minor details in the apparatus used. The use of threads is not essential, and the method might perhaps be better called *dried cultures method.*

Dried Cultures (or Thread) Method, used by the Writer.

In the first instance I will describe the method as carried out when the *Bacillus coli communis* or the *Bacillus typhosus* is used as the test microbe.

Preparation of Standard Cultures.

A sloped agar tube is inseminated with 1 loopful (about 1 milligramme) of an actively growing culture of bacillus giving all the reactions characteristic of the organism. The loopful of material is spread all over the surface of the agar.* The culture is incubated for 48 hours at a temperature of 37° C.

Preparation of the Emulsion.

At the end of this time the surface of the agar should be covered with an abundant growth; 2 cc. of bouillon* are poured over the culture, and with a sterilised platinum needle the growth is scraped off carefully (without damaging the surface of the medium) and mixed with the bouillon. The tube is then shaken until a homogeneous emulsion is produced. Good cultures should not produce flocculent emulsions.

Preparation of Threads.

Closely twisted silk thread,† a little less than ½ millimetre in diameter, is cut in 2 cm. lengths. 50 threads (2 cm. long) are placed in a small covered capsule about 3 cm. in diameter.

They are then sterilised by saturated steam at 115°C. for half an hour.

When the capsule is cool again, the 2 cc. of freshly prepared emulsion are poured into it, and the threads are stirred with a sterilised needle until they are all thoroughly soaked. After a contact of a quarter of an

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* The nutrient agar is prepared with peptone bouillon made according to the method used in Koch's laboratory. The reaction is + 5 per 1,000. Lately I have also been using + 10, and also + 15 nutrient agar and peptone bouillon. There does not seem to be any serious reason to prefer + 10 to + 5 or *vice versâ*, but the + 15 agar does not give as good cultures as the more alkaline media. To simplify matters I would propose to use a + 10 reaction in all cases.

† When certain disinfectants (*e.g.*, strong solutions of chlorinated lime) are tested it may be necessary to use cotton or flax thread, but for general purposes silk is preferable.

At first I employed loosely-twisted surgical silk, but of late years I have found closely-twisted silk more suitable. Lister's super quality No. 12 white button-hole silk is very suitable; the thread is composed of three closely-twisted strands, its diameter is about 0·4 millimetre, and one metre of it thoroughly dried weighs on an average 0·072 gramme.

Originally I submitted the silk to a thorough washing in dilute hydrochloric acid, followed by a second washing in dilute caustic soda, and a final washing in distilled water until all trace of alkalinity had disappeared. Afterwards I treated the silk by a mixture of hot alcohol and ether, after which it was washed in distilled water. Further experience showed me that these precautions were unnecessary. The threads prepared with silk washed in acid and alkaline solutions behaved exactly like those which had been simply sterilized by steam. Those washed with alcohol and ether seemed to be a little more resistant than those not so treated, but the effect was slight and doubtful.

hour's duration the threads are removed *one by one* by means of *fine pointed forceps*, and arranged in parallel rows on the bottom of shallow sterilised glass capsules (a Petri dish is very convenient). The threads must not touch each other, and must be moved about as little as possible.

The threads are then dried rapidly at a temperature of 37° C. The drying should be completed in less than three hours. The capsule must remain covered, but the lid should be raised slightly so as to allow evaporation.

When the threads are dry the capsule is closed again, and transferred to a dark cupboard at the ordinary temperature of a living room. During all the previous operations exposure to direct sunlight, and even to strong diffused sunlight, must be avoided.*

EXPOSURE OF THE THREADS.

10 cc. of each of the dilutions† of the disinfectant to be tested are placed in glass capsules 4 to 4½ cm. in diameter and of about 20 cc. capacity. The depth of the fluid should be as constant as possible. Two impregnated threads are then placed in each dilution. A series of dilutions can thus be infected successively at intervals of one-third or half a minute. Each thread is picked (from the capsule in which it has been dried) by means of sterilised fine pointed forceps,‡ and waved three or four times in the disinfectant before being allowed to sink in it.

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* The threads so prepared retain a fairly constant amount of culture; the following weighings taken during the course of one year show the amount of variation :—

Bacillus coli communis (2 days old culture)	Maximum weight of culture retained			0·00032	gramme.
	Minimum	„	„ „	0·00020	„
Bacillus typhosus (2 days old culture)	Maximum	„	„ „	0·00033	„
	Minimum	„	„ „	0·00025	„
Bacillus anthracis sporing (7 days old culture)			„ „	0·00038	„
Bacillus pestis (3 days old culture)		„	„ „	0·00043	..

These threads offer the maximum degree of resistance to disinfection during the first two or three days after drying. Their resistance diminishes very slowly and gradually during the following months. The bacillus typhosus becomes less resistant more rapidly than the bacillus coli communis.

† The preparation of the dilutions is in this, as in all other methods, a matter of the utmost importance. The original material used in the preparation of the dilutions is weighed and not measured by volume (unless its solutions can be accurately titrated). A first dilution of the strength of 1 in 50 or 1 in 100 being accurately prepared by weight, the higher dilutions may be prepared from it by volume without material error. In estimating the relative cost of various disinfectants the weights may afterwards be reduced to volumes when necessary. The chances of serious error in the preparation of the solutions are greatly diminished when fairly large quantities are made.

‡ The flame used for sterilising the forceps must be placed sufficiently far from the row of capsules to prevent any of the capsules being heated. At a distance of 8 or 10 inches a Bunsen burner may cause a material rise of temperature (up to 5° C.) in 20 minutes.

After infected threads have been placed in all the disinfecting solutions, the glass capsules containing them should be slightly shaken two or three times; this is specially important in the case of emulsions which have a tendency to produce a sediment.

Duration of the Exposure.

According to the test microbe employed the standard time of exposure differs.

If phenol is used as standard of comparison, and the strongest solution of phenol used is of the strength of 1 in 50, the following times are the shortest that can be conveniently adopted:—

Five minutes for the *Bacillus pestis*; ten minutes for the *Bacillus typhosus*; twenty minutes for the *Bacillus coli communis* and the *staphylococcus pyogenes aureus.*

Sporing bacteria cannot be conveniently used when phenol is taken as standard.*

Temperature.

Experiments should be conducted at temperatures ranging between 15·5° C. and 18° C. (60° F. to 65° F.), which are easily obtainable in living rooms. The effects of a marked rise of temperature are greater in the case of some disinfectants than in that of others, and comparative experiments carried at various temperatures do not give comparable results.

Arrest of the Action of the Disinfectant and Washing of Threads.

To arrest the action of the disinfectant as rapidly as possible and at the same time wash the threads, a number of covered glass capsules similar to those containing the disinfectant solution are used, in each of which 10 ccs. of sterilised water have been measured. At the end of the exposure each thread is taken out of the disinfectant separately by means of fine pointed forceps, and transferred to the corresponding capsule of distilled water; the threads are waved two or three times in the water before being deposited. The threads are left for ten minutes in the water, during which time the capsule is shaken from time to time.

* When high dilutions are tested, the time of exposure must be increased. No investigation can be considered complete unless the time which dilutions in practical use take to kill the test microbe is ascertained, and to obtain the relative value of these dilutions it is necessary to find which dilution of phenol would produce the same effect in the same time. For practical purposes dilutions which are not germicidal in a fairly short time are of little value. Thus it is unlikely that dilutions which do not kill non-sporing microbes in less than 12 hours, or even 6 hours, are of any practical value. Some disinfectants are much more affected by dilution than others.

At the end of ten minutes the threads are transferred from the water to covered tubes containing 5 or 6 cc. of peptone bouillon +5.*

INCUBATION.

The loaded tubes of bouillon are then incubated at 37° C. They are examined at the end of twenty-four hours, and again at the end of forty-eight hours, and any evidence of growth is noted each time.

CONTROLS.

Each experiment is controlled by means of threads belonging to the same batch as that used for testing. These threads are left in 10 cc. of sterilised water for a period of time equal to that of the exposure plus that of the washing, before they are transferred to the bouillon. Other threads of the same batch are submitted to the action of dilutions of the disinfectant used as standard for comparison. All the exposures must be made at the same time and under the same conditions.

EVIDENCE INDICATING DEFECTS OF TECHNIQUE.

When in a series of six or twelve tubes corresponding to dilutions of gradually increasing strength one finds among the sterile tubes a stray tube showing some growth, or *vice versâ*, among the non-sterile tubes some showing no evidence of growth, some error must have been committed.

In a series of several hundred sets of experiments, I have not observed such accidents in more than two or three sets out of each hundred sets.

With reasonable care it is easy to conduct a very large number of experiments without accidental contamination, provided covered vessels are invariably used.

APPARATUS.

Ordinary culture tubes and capsules are quite sufficient for the purposes of such experiments; but to avoid waste of time and confusion leading to accidents, I have found it convenient to use capsules and test tubes covered with glass caps. Culture tubes plugged with cotton are very inconvenient. Stands upon which particulars can be entered opposite each test tube also save much time. All the vessels used for making dilutions, containing sterilised water, or culture media, should be of good glass, as insoluble as possible. Jena or Resistance glass is the most suitable for the purpose.†

* The reaction +5 has been used in my laboratory, but I would see no objection to +10 being adopted (*see note under* "Preparation of Standard Cultures").

† Some ten or twelve years ago a large amount of cheap test tubes, flasks, etc., were put on the market, and on trying to discover the cause of the abnormal appearance of some cultures, I found that the culture media had become highly alkaline. This was due to part of the glass having been dissolved. It is obviously useless to pay attention to the

Influence of various Products on the action of Disinfectants.

So far I have supposed that the object in view was to test the relative value of various disinfectants diluted with water, but this seldom gives an accurate idea of the way in which the disinfectant would act in practice.

The action of each disinfectant should be tested in presence of such products as are likely to require disinfection; the following are fairly representative :—

Blood.	Milk.	Sputum.
Urine.	Fæces.	Soil.*

In laboratory investigations simpler compounds may also be used, *e.g.*:—

Acids.	Various salts.	Various carbohydrates.
Alkalis.	Various proteids.	Urea, etc., etc.

When testing the effects of these normal or morbid products upon disinfection, I place the threads in 5 cc. of the material, and after one minute I add 5 cc. of a solution of the disinfectant, the strength of the dilution being twice that which one desires to test.

The mixture is then stirred thoroughly several times during the exposure. Fæces and sputa are the most useful products for practical purposes.

In testing the action of sputa, it is desirable to mix some five, six, or more sputa of different types, some being thin purulent, and others fairly thick and mucous. The mixture should be sterilised in the autoclave, and then thoroughly shaken; in this way a manageable fluid is obtained, and the mixture secures a fairly average composition.

Typhoid or diarrhœa stools are prepared in the same way.

Blood should be first defibrinated, and if properly collected need not be sterilised.

Blood serum collected aseptically may be used without previous sterilisation.

Milk must be sterilised, it is seldom needed.

One part of soil must be mixed with ten parts of water, and then sterilised by steam at 115° C. for half an hour at least.

To find again the threads in these mixtures, it is generally sufficient to pour the contents of the capsule into its lid.

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reaction of the media, if care is not also taken to avoid using glass of this kind. To test whether the glass is of good quality, the test tubes or flasks are rinsed with cold water, then after being partly filled with distilled water they are placed in the autoclave and kept at a temperature of 115° C. for half an hour; if the glass is bad the water becomes strongly alkaline.

* For general routine work, fæces, sputa and blood are sufficiently representative.

To test the action of Disinfectants when applied to a Surface.

For this purpose I use the threads* in two ways:

(*A.*) The threads are dipped in the disinfectant for one minute, after which they are laid in a large sterile capsule, where they are allowed to dry slowly. They are then taken up at intervals of one hour for six hours, then, at the twelfth and twenty-fourth hour, washed for ten minutes in sterilised water, and then placed in tubes of nutrient bouillon as previously explained.

(*B.*) The threads are placed on a piece of sterilised paper or cardboard and exposed to the action of the sprayed disinfectant, or the disinfectant is brushed over them with a soft brush. After this they are treated as explained above.

To Test the Action of Gaseous Disinfectants.

The threads are placed in small covered capsules which are distributed in various parts of a room of known capacity and then uncovered. A known quantity of the gas is generated, and at the end of 6, 12, or 24 hours the room is opened. To make comparable experiments, a special room, at least 1,000 cubic feet in capacity, with properly guarded openings for observations, is devoted to this work in my laboratory.

To Test the Penetrating Power and Diffusibility of Gaseous Disinfectants.

To test the penetrating power of disinfectants I use a board, against which a metal ring can be tightly clamped. Under the ring several layers of filter or other paper are placed, so that when the ring is clamped the spaces between the sheets of paper are tightly closed at the periphery. Before clamping the ring a few threads are placed between each two layers of paper. At the end of the exposure the ring is unclamped, and the threads exposed after each layer of paper has been removed are treated as previously stated. The diffusibility of gaseous disinfectants is tested by using glass tubes a quarter of an inch in diameter, and varying in length from 3 inches to 12 inches; the threads are placed at the bottom of the tubes, which are distributed in various parts of the room.

To Test Methods used for the Disinfection of Tuberculous Sputa.

As it is difficult to load threads with sputum, I prefer to dry tuberculous sputa on pieces of sterilised pure filter paper ½ cm. square. When the sputum is quite dry the paper is treated in the same way as the threads, but instead of using the culture method to find out whether the tubercle bacilli have been killed it is necessary to inoculate guinea-pigs, which are

* or infected pieces of paper.

kept under observation and killed at the end of one and two months respectively. A careful post mortem examination is then made. This method is used for testing methods of surface disinfection. For testing the action of disinfectants on fresh sputa, the disinfectant is mixed with the sputa, and the action tested by the inoculation of guinea-pigs with ¼ to ½ cc. of the mixture. Several guinea-pigs are inoculated with various parts of the mixture.

General Remarks and Conclusions.

This account of the thread method, though incomplete, is sufficient to show that nearly all the problems of disinfection can be studied by means of this method. By the exercise of reasonable care it has in my hands yielded very constant results, and has not led me to form an exaggerated opinion of the practical value of any of the disinfectants I have tested. It is certainly more complicated than the old fluid methods, and does not bring out such marked contrasts as those obtained when naked bacteria are used; but considering the fact that one has never to deal with naked bacteria, and that the chief object of testing disinfectants is to find out how far they effect their purpose, I feel justified in recommending the thread method as a general method, whenever *the relative practical value of various disinfectants* is under inquiry. I believe also that before expressing an opinion the bacteriologist is bound to test the action of the disinfectant under the various conditions which may affect materially the power of these products.

Any method, such as the drop method, by which the action of various chemical agents upon bacteria suspended in distilled water is ascertained, may be useful to chemists engaged in the manufacture of disinfectants, or in researches bearing upon the relative activity of various derivatives of one group of substances. The indications obtained by this method show the directions in which good results may be expected; they may also be used to test the strength of a given product. But I do not believe that the action of disinfectants upon naked bacteria can be taken as the sole basis for estimating for practical purposes the relative value of various disinfectants, some of which are soluble, while others are unsoluble and used in the form of emulsions. To express the relative power of disinfectants by a carbolic acid coefficient obtained by such a method is misleading, unless the results so obtained are controlled or modified by a statement of the results obtained by a method, such as the thread method, by which it is possible to place the bacteria under conditions resembling those likely to occur in practice. It is obvious, however, that the standardising of each method is a matter of importance.

THE

SEWAGE PURIFICATION PROBLEM,

with special reference to Sewage Discharge into a Tidal Estuary.

By JAMES D. WILLIAMSON, M.D., &c.

Vice-Chairman, Police Committee, Belfast Corporation.

Read at Sessional Meeting, Belfast, October 5th, 1906.

AS an ordinary member of the medical profession who has given some time to the study of questions affecting the health of the city, as well as other matters under the control of the Corporation, I claim at least an interest in the subject under discussion; and, as my convictions are rather firmly rooted, I should like to have them either confirmed or condemned by the members, and I therefore invite a full and frank exchange of views. Naturally, my remarks deal with Belfast, or places similarly situated, and a short description of the main lines of the sewers in the city, and the outfall works, may be useful.

Belfast is situated on a flat area each side of the harbour and river Lagan, extending about half a mile from the banks; it then rises something like 1 in 20 to 1 in 25 rather rapidly towards the hills on each side. The flat portion of the city is at and near the level of high water; indeed, a large portion of it is many feet below the highest recorded tide level. The range of tide in Belfast is about eight feet. When the city was in its infancy, the buildings and streets were constructed as close to the river as possible, without any reference to proper drainage, as, owing to limited water supply, it was never anticipated that the city would grow to such dimensions, and the sewerage problem become so great. About forty years ago, however, a great development of trade occurred in the North of Ireland, and the people of Belfast were not slow to take advantage of it. Streets and houses sprang up in all directions, and the Corporation of that day promoted a Bill for the better regulation of municipal matters. The scheme of main drainage for the city, prepared by the late J. J. Montgomery, M.Inst.C.E., the then surveyor, was referred to Mr. (afterwards Sir) Joseph Bazalgette, who endorsed it in the fullest way. The Corporation, however, did not see their way to carry out these recommendations, and it was not until after Mr. Montgomery's death that they

felt justified in undertaking the expenditure on what was then considered a gigantic scheme. A reference to Mr. Montgomery's report of 1865 shows that the scheme, as designed by him, was anticipated to serve the city for twenty years; and, to my mind, it was because the scheme of 1865 was only carried out in 1885, and then only in a modified form, that much of the trouble attributed to the main drainage has since arisen. The drainage is carried by two sewers (one called the high level and the other the low level sewer) to the outfall works, which was the only feasible way of collecting the sewage unless an entire scheme of pumping had been resorted to. When the late surveyor, Mr. J. C. Bretland, M.Inst.C.E., was instructed to carry out the scheme he was faced by the difficulty that the outlet shown on the original scheme was unapproachable, a dock having been made over the site. He had also to face difficulties connected with the harbour improvements, both those in progress and projected, and was forced, much against his will, to place the outlet in its present position, and not in the deep water channel, as originally intended. He had also intended the outlet sewer to be made of heavy cast-iron pipes, but the opposition, I understand, of owners on the County Antrim shore forced the hands of the Corporation to adopt a wooden shute one mile long instead of a shorter length of iron pipes. This wooden shute, which has given a great deal of trouble ever since, conveys the sewage to deep water. In order to obtain a satisfactory outlet discharging on the outgoing tide the sewage has to be stored in a reservoir, and permission was given by Parliament to discharge for 3½ hours after high water, the intention being that the tide should ebb for three hours after the discharge ceased, and thus carry the sewage away into deep sea. The effect of this in operation was to clean the banks of the Lagan above the bridges, and soon after the works came into operation fish were caught in the harbour and far up the river at places where they had not been seen for many years; the smells from the river banks also ceased, and the improvement in the condition of the harbour and the river was apparent to everyone.

Whilst this improvement occurred within the city, complaints arose that the smell on the foreshore on both sides of the lough was becoming worse. Everyone along the shore condemned the main drainage, and it was made responsible for all the evil smells, real and imaginary, detected anywhere between Belfast and the mouth of the lough, whilst ignoring at the same time the important fact that hundreds of sewers outside the city discharge their crude sewerage into the lough. As those

members who arrived by steamer may have observed, many thousands of acres of the foreshore are dry at low water. On these sloblands, as they are called, seaweed, chiefly *Ulva latissima* (or sea lettuce) has developed in increasing luxuriance since the sewage discharge from the city was concentrated in its present position. It is only fair to observe that this weed has been on the banks in more or less quantity within the memory of the oldest inhabitant, but it cannot be denied that it has increased in quantity during later years. The occurrence of *Ulva latissima* in a locality has been recognised as evidence of sewage pollution, and the plant is said to act as a sewage scavenger. Whilst thus acting it gives rise to an extensive nuisance owing to the nature of the weed, because its food is more of an animal than a vegetable product. So long as it is kept under water it does not give rise to any offensive smell, but when exposed in large quantities to the action of the sun it gives off sulphuretted hydrogen; hence the unpleasant and noxious odour in the surrounding neighbourhood. The complaints became so urgent that the local authorities of districts outside the city applied to the Local Government Board, and obtained a provisional order forming a joint Board, with powers to clean the foreshore on the County Down side.

The difficulty of sewage disposal in places situated like Belfast is no small one. This was foreseen so long ago as 1870, when the Corporation promoted a Bill for inclosing the sloblands from the Twin Islands to Macedon on the Antrim side, and to Holywood on the County Down side; but so short-sighted were the inhabitants of the city at that time that they forced the Corporation to withdraw the Bill, and the members and officers were left to pay the expenses out of their own pockets. I may say, however, that such an outrageous proceeding could not occur now if the procedure under the Borough Funds Act be complied with, and I think there is sufficient public spirit amongst the ratepayers to prevent their representatives being mulcted when they have been doing their very best to help the town out of a difficulty. In consequence of this fiasco nothing was done towards sewage purification or utilisation until after the main drainage works were in operation. In 1899 the Corporation put a clause in their Act undertaking to purify the sewage to the satisfaction of the Local Government Board before discharging it into the lough, and since that time have been experimenting with a view to ascertaining the best and most economical method of doing this. The fine water supply now provided for Belfast enabled the Corporation to insist on all houses being supplied with w.c.'s, and in the year 1899 the Corporation obtained powers

to compel the conversion of privies* into w.c.'s. The accomplishment of this added enormously to the sewage of the city and the impurities to be removed therefrom, thereby increasing the difficulty of dealing with the sewage in a satisfactory and economical manner.

As the members of this Institute are aware, the problem of sewage purification and disposal is by no means a new one. If we go back far enough the disposal was considered satisfactory when the sewage had been discharged into the nearest water-course or into the sea, no thought being given to the health of the persons who might use the water further down the stream. As communities grew the volume increased until the pollution became unbearable, and we had engineers and chemists at work, each advising his own particular fad for the cure. The Rivers Pollution Act with all its faults created consternation amongst the local authorities on the higher reaches of the rivers, and we had broad irrigation, intermittent downward filtration, upward filtration, precipitation by all sorts of chemicals, sludge presses producing sludge cake, and last, but by no means least effective, bacterial purification. The towns situated by the sea-bord discharged their sewage further and further to sea, relying upon the dictum of the late Sir Robert Rawlinson, chief engineer of the English Local Government Board, that when a town on the sea-bord had discharged its sewage into deep water it had done all that could reasonably be expected from it. Unfortunately, however, the large towns are not situate in all cases on the sea-bord, there being usually a stretch of river or lough between them and deep water, but generally without sufficient outgoing current to carry off the sewage entirely, as, for instance, Glasgow, Edinburgh, Belfast, Southampton, and London, and many others unnecessary to mention. The difficulties in London are well known, and the state of the Thames at low tide requires no comment. Our own city is no better and no worse than some other places. The increasing attention given to public health matters in later years is very satisfactory, and the Corporation has been doing its best to grapple with this question of sewage purification in Belfast with due regard to economy, and while they have been blamed on the one hand for not proceeding more rapidly, they are highly to be commended on the other for the caution exercised in making sure that whatever method is carried out will be effectual and cheap, involving the smallest annual cost to the ratepayers.

One thing that seems to be forgotten here is that Belfast is a growing city, that the volume to be dealt with increases from day to day, and that it has exceeded all the estimates of the last generation. An

* These numbered about 30,000.

example of the caution exercised by the Belfast Corporation, which is perhaps not known to the people of the present day, is that it was at one time seriously considered to convert the present sloblands into sewage farms. The cost of this to the ratepayers here at the present day would be fabulous, and owing to the levels of the city a sewage farm is impracticable; but although this is so, I must not be taken as indiscriminately condemning sewage farms, as there may be many places where they act admirably. Birmingham, however, may be pointed to as a city which suffers financially from the extent of its sewage farms. I saw recently a statement by one of the public officers there that they must go on adding one acre per week to the farm if they are to deal with their sewage by this method. Where, in such a case may I ask, is the land to come from ultimately?

Having examples of so many other towns before them, I feel the Corporation acted wisely in waiting to see an effectual system in operation before they committed themselves to any definite scheme. Bacterial purification seems to have been a greater success than any other yet in use, and to-day everything is to be said in its favour. The difference of opinion seems to refer only to the method of supplying the sewage to the bacteria and the mode in which the beds can be best constructed. Our surveyor, Mr. Cutler, has given great attention to this matter, and I have no doubt you will hear from him the result of his recent investigations. Personally, I am glad that precipitation has proved a failure for large cities, because the extraction of filth from the sewage and piling it up in large quantities was clearly a wrong method, as the water was only used for carrying this filth underground from the places of its origin to the outfall works, where it had to be extracted from the water, and, although we were told of the great manurial value of the organic matter so extracted, it was carefully kept in the background that the amount of inorganic matter so far exceeded the organic as to make it practically useless as a manure, and any process to separate these was more costly than the resultant guano, proving that owing to its cost the method was a wrong one.

The difficulties of dealing with sewage are real. This was recognised by the Government, and in May, 1898, they appointed a Royal Commission to inquire into the subject. This Commission has been at work since, assisted by experts and others, who have made this process a special study. The result of their combined labours has been the issue of at least fourteen volumes, and more to follow; but still the question remains unsolved. Now, if after eight years' investigation and study this

Commission has been unable to suggest a cure suitable to all cases, the Corporation of Belfast may be excused for their caution and hesistancy to embark on an expenditure of, say £200,000, without doing their best to make sure of its utility.

Now, I come to what they have been doing: To their credit be it said, the Corporation, with great foresight, so long ago as 1878 secured land—over 100 acres—for a site for purification works, and they have since reclaimed that from the sea. Other towns have had to pay enormous sums for sites, probably twenty times what it has cost us. On a portion of these lands they have erected experimental works, which you will have an opportunity of seeing to-morrow under the guidance of Mr. Cutler, and experiments with every kind of bed, sprinkler and filter, large material and small material, covered and uncovered, effluent ponds, tc., have been carried out for the past ten years. Those distinguished scientists, Professors Letts and Lorraine Smith, have spent a great deal of time in investigating the results both chemically and bacteriologically. Their reports of the results have been published, and I have no doubt been read by many of those present. Unfortunately they do not seem to have yet decided to their satisfaction on any means whereby the effluent can be deprived of the nourishment it at present contains for those green weeds. In a paper read by Professor Letts before the British Association a few years ago, he pointed out that these plants, chiefly *Ulva latissima*, were products of sewage pollution, and quoted a number of places in support of his opinion, and for a history of the plant I must refer you to that paper. In a report to the Corporation in the year 1901, he advocated growing the weed in ponds in order that the nitrogen and free ammonia might be completely removed from the effluent before discharging it into the lough; but I understand that from larger experience gained since that time, in the course of investigations on the subject conducted for the Royal Commission on Sewage Disposal, or on behalf of the Corporation, I do not know which, he has modified his views.

Having now outlined generally the case as it relates to Belfast, I come to the point of the paper, viz., the effect of sewage discharged into tidal waters. One objection to the discharge of crude sewage into the lough is the damage to fish. This applies more especially to shellfish. In years gone by our lough was famous for its herrings, and many of the older inhabitants will remember the morning cry—"Fresh Carrick Herrin'." Mussels, cockles, crabs, and other shellfish were at one time plentiful: indeed, some are still; but instead of being wholesome food, they can only be used as bait. Their use for the food of man has been prohibited, not a

moment too soon, as frequently cases of illness have been traced to the use of this shellfish. In my opinion, the discharge of so-called purified sewage will not improve matters, because the effluent, whilst clear to the eye, contains the food for the *Ulva latissima* in the form of uitrates, and so long as the effluent contains these it will, when mixed with sea water, nourish the *Ulca latissima*, and therefore will have no tendency to reduce the objectionable deposits on the foreshore.

The question therefore arises: Is the Corporation justified in the large expenditure necessary for the bacterial treatment of the sewage when the only result for all practical purposes seems to be clarification? To me it is clear that before this expenditure is undertaken, the chemists and bacteriologists who are studying this question will have to find out some means of separating the nitrogen from the effluent, because until this is done there can be no reduction in the growth of the weed, and consequently no hope of clearing the foreshore by this means. Some of our critics have expressed the opinion that the only cure is to carry the sewers so far to sea at enormous cost as will give an outlet in a position where the outward currents will carry the sewage beyond risk of return. Of course, the cost of this and the necessary pumping machinery would be enormous, but it is a question whether this great cost would not be better and cheaper in the long run when one thinks of the worry and additional annual cost which would be involved by keeping the outlet nearer home, in what will before many years, we trust, be the centre of a large district, because Belfast is growing rapidly, and we hope it will continue to grow along the shores on both sides of the lough. Our shipyards and docks are going further and further outwards, and now that the trans-Atlantic liners have commenced calling once more in the lough, we expect that within a few years we shall have such a flourishing port that we shall be able to afford the disposal of our sewage in the way I have indicated, should that become a necessity. When the Corporation of Belfast effectually disposes of its sewage, they will be in a position to demand a similar course by each of the towns, villages, and rural districts along the shores of the lough, which now deposit their filth in the most elementary manner from Belfast to Bangor and Blackhead. This ideal will be realised when, from the nitrates having become so much reduced or altogether absent, the effluent affords no food for the green weeds; they can only be fed from the mud banks which have been polluted by sewage. In my opinion, it will take some years to eliminate all the material which is food for the weed before any very great improvement is manifested. At the same time, I think the Belfast Corporation should take the neces-

sary steps to protect their own interests, by insisting that the rural districts should be made to protect the streams and rivulets into which the owners of villas and other buildings now discharge their drainage, and compel them to so satisfactorily dispose of their sewage as to render it innocuous. The towns and villages should be compelled to do what Belfast will have done; then, and not till then, shall we have an unpolluted lough and a pure atmosphere. Various authorities have informed us that the lough is so polluted with sewage at present, owing to the slack currents, that bathing is not advisable; and when the drainage from Sydenham is discharged near the Victoria Park, I should like to know how we are to obtain sea water of sufficient purity for the large swimming pond which we are being pressed to provide in that park.

It must not be taken that I am averse to bacterial treatment, because I am a firm believer in its efficacy in the case of inland towns discharging their effluents into large water-courses, especially if it can pass over land in the first instance; but it should be remembered that a water-course is always flowing in the one direction, with the natural tendency to purify itself, whereas effluent discharged into the sea is taken first in one direction and then in another by currents, and the temperature of the sea being, as a rule, lower than that of the effluent there is a tendency for the effluent to float on the top, which is enhanced by the fact of its less specific gravity; and any action of the wind drives it on the banks to feed the weeds. Until a solution of this difficulty, the removal of the nitrogen, is found, it is feared the foreshore must be kept clean by collecting the weed as is at present being done.

It is a pity that the farmers in the neighbourhood have not paid more attention to the value of this weed as a manure. Its constituents are such that if judiciously applied, very little, if any, manufactured manure need be purchased, as the weed contains plant food in a concentrated form. There are cases where the farmers are using the weed with the most satisfactory results. It has been suggested that owing to the quantity of ammonia in the *Ulva latissima*, the weed might be profitably gathered and stored for the extraction of this chemical. With the amount of moisture the weed contains, however, and the loss of bulk by drying, we cannot regard it as having a commercial value for chemical purposes.

I have now placed before you some of the difficulties presented by sewage discharged into a tidal estuary as in Belfast. I do not suppose you will all agree with my views, but my object will have been attained if some of those present, who are recognised authorities on the question, will join in the discussion, and give us the benefit of their observation and

experience in connection with sewage purification, and beg you will remember that I do not pose as an expert in this matter, but simply as an ordinary member of the Corporation, desirous of obtaining information for the benefit of the ratepayers on this great question.

THE CHAIRMAN (Ald. Dr. J. King Kerr), who was warmly received, explained that the Lord Mayor had been compelled to leave the city by reason of an important engagement, but in his absence he (the speaker) extended to the members of The Royal Sanitary Institute a most cordial welcome as fellow workers. That welcome was offered in no perfunctory or formal sense. He did not know that he could better express the nature of their work than by adopting the motto which the Association had chosen, "Salus generis humani." The members were also welcomed in the hope that in their inspection of Belfast's public undertakings and works they might gain some useful information, and that when they saw these works and heard of those in which the city was about to engage, they, from their expert knowledge, might be able to give some assistance to those who were responsible for carrying out these undertakings. The city was face to face with very serious problems. He quoted statistics showing the remarkable increase of Belfast in population, trade, commerce, and industrial enterprise. While their forefathers left them a legacy of great works, industries, and enterprises, they had also left a legacy of defects in sanitation. Buildings had been rushed up which were not sanitary in all respects. They of a later generation had to deal with back-to-back houses, with narrow streets, with close and badly-ventilated alleys, with overcrowded artisans' dwellings, and with an imperfect water supply. They had, however, successfully grappled with most of these problems. They had practically no back-to-back houses: back passages must now have a minimum width of nine feet; the streets were enlarged, and many of them were of noble proportions; ill-ventilated alleys and courts had been swept away, and the artisan classes occupied comfortable houses; while the Water Commissioners had spared neither pains nor money in endeavouring to provide a pure supply from the watershed of the Mourne range. The general introduction of water-closets, while relieving them in one way, had created a serious difficulty in another by polluting streams, rivers, and even the lough itself. That was one of the problems which they were attempting to grapple with under difficult and peculiar local circumstances which he need not enlarge upon, but which would form the subject matter of consideration that evening.

MR. KAYE-PARRY (Dublin) said that the subject under discussion had not hitherto received as much attention as its importance deserved. There was no doubt that the conditions which obtained in outfalls of this character differed

materially from those which governed sewage discharge into rivers and water-courses. The position of the outfall with reference to the estuary and the nature of the estuary itself as regards its length and character also varied greatly in different towns. When the estuary was short, and there was a good current setting seaward, the danger of creating a nuisance was greatly decreased. This was the case in Dublin where the sewage from Rathmines and Pembroke was delivered into the estuary of the Liffey. An attempt had been made to show that the outfall had created a nuisance, but the speaker was of opinion that the case had not been proved. The Rathmines and Pembroke sewage was impounded during the flood tide and only discharged on the ebb. Before it was delivered into the estuary, the heavier solids were removed by means of screens and catch pits, with the result that no accumulation had taken place in the river bed below the outfall. In fact, investigation had shown that the liquid sewage remained near the surface, and that the lower part of the channel was almost pure sea-water. Some reference had been made to the presence of nitrates in an effluent as encouraging the growth of the *Ulva latissima,* but it must be borne in mind that *per se* the presence of nitrates in an effluent was a sure sign of efficient purification, and, if he (the speaker) understood correctly the effect of Professor Letts's experiments, it would appear that the most potent factor in the sewage in encouraging the growth of the ulva was the free ammonia. As the free ammonia was very greatly reduced in an effluent containing a percentage of nitrates, it appeared that on the whole the treatment of the liquid, either in contact beds or through continuous bacterial filters, must have a beneficial effect upon the lough so far as the growth of the ulva was concerned. The opinion he had formed was that when the conditions were favourable, as in Dublin, all that would be necessary would be to screen and strain out the solids as far as practicable, and to deliver the liquid into the estuary during the ebb tide; but when the conditions were not favourable, as in the case of Belfast, some treatment, such as that which would result from the introduction of bacterial filters, would be necessary to preserve the lough from the evils resulting from sewage contamination.

Mr. James O'Dempsey (Dublin) complained that the storage tank was too low. Effluent had been discharged at low tide, and as a consequence the incoming tide brought the sewage back, depositing it on the shores of the lough. He contended that the city was splendidly situated for discharging a great volume of sewage into deep water. He was satisfied that the bacteria bed system was useless. He had seen *Ulva latissima* dried and used for stuffing couches.

Prof. E. J. McWeeney (Dublin) said that Dublin afforded unusual opportunities for the comparative study of the subject which they had met that evening to discuss. They had, first, the discharge of an enormous volume of crude sewage into a tidal stream of relatively small proportions. The result was the formation of large unsightly sludge banks, that were uncovered at low

water and caused an abominable nuisance. In the second place, they had the system which had just been completed, at a cost of over a quarter of a million, whereby the sewage, after being deprived of its heavier solids by a lime-precipitation process, was to be run, as a partly purified effluent, into the estuary of the Liffey. In the third place, they had the crude sewage of the populous suburban districts of Rathmines and Pembroke, containing some 60 or 70 thousand people, discharged into that estuary a few hundred yards below the new Dublin Main Drainage Outfall. Although not officially connected with the working of either system, he had had occasion to become familiar with the disadvantages arising from the discharge of sewage into such a tidal estuary as that of Dublin. They were of two sorts, hygienic and economic. The hygienic drawbacks were, firstly, contamination of shellfish with disease germs, mainly those of typhoid and certain forms of gastro-enteritis: secondly, the befouling of sea-water so as to render it dangerous to swallow in the act of bathing; and, thirdly, the lowering effect produced on the inhabitants by the inhalation of foul gases. The economic drawbacks were, firstly, the repulsive effect of a foul foreshore, which hindered the influx of people who might otherwise come to live in the locality; secondly, the destruction of fish and consequent ruin of the fishing industry; and, thirdly, the formation of sludge-banks, which might impede navigation. Regarding the contamination of shellfish, the possibility of that occurrence had been over and over again demonstrated, and was formally accepted by the Royal Commission on Sewage Disposal. Before such an audience he need not refer to the particular instances. Bacteriological examination had hitherto failed to demonstrate the presence of the actual specific disease germs (he referred to those of typhoid and para-typhoid) in a satisfactory manner, but it yielded valuable information as to the extent of the potential danger. He stated that on the strength of nearly 800 such examinations which he made in 1903 of specimens sent to him from all parts of the Irish coast line at the instance of the Local Government Board, the only shellfish he had found free from sewage organisms were those dredged from the deep sea, and the only ones the *vast majority* of which were free, came from the sparsely populated coast line of the West and South-west of Ireland. Cockles he had found to be grosser feeders than oysters, and more likely to become laden with sewage germs; but this danger was more than counterbalanced by that arising from the fact that oysters were usually eaten raw and cockles were commonly cooked. They did not need to be boiled, as the typhoid germ was sensitive to heat, being killed at 60° C. or 140° F. The remedy, he considered, lay in the non-utilisation of foreshores, such as those of Dublin Bay or Belfast Lough, for shellfish culture. Crude sewage was sure to contaminate the shellfish, as the specific disease germs were protected, by being enclosed in solid masses of objectionable matter, from competition with the hardier ones of putrefaction. Treated sewage was less dangerous in proportion to its freedom from suspended matter, and the length to which oxidation had been carried, in

a word, to the efficiency of its treatment. Any sort of treated effluent he regarded as vastly superior to crude sewage, owing to the fact that the solids, even though only partially removed, were at any rate broken up. With a single exception, he thought that lime effluents were more dangerous than those from any system of bacterial treatment. The exception was when a very large amount of lime (some 60 or 70 grains per gallon) was added to the sewage. This caused a bulky precipitate in which many of the micro-organisms were entangled, and, as was well known, the effect could be still further enhanced by the addition of alum. Only that very week he had observed that a drinking water in process of softening by the Clark system flowed sterile from the lime tower, having previously contained over 100 ordinary and twenty blood-heat germs per cubic centimeter. He would like to see this process tested by the Dublin sewage engineers, at any rate, on a small scale. On the large scale he feared the amount of sludge would be more than they could cope with. The primary object of bacterial treatment being to render an effluent suitable for pouring into a drinking-water stream, he doubted whether it was really called for in the case of a tidal estuary. The advantage of the system was the great clarification and relative innocuity of the effluent, for he must admit that he was inclined to be sceptical as to the power of typhoid germs to survive the septic tank and contact beds. The theory that they could do so was mainly based on the experiments of Houston with *Pyocyaneus*. The speaker had, however, often isolated typical pigment-producing strains of that organism from sewage to which it had certainly not been deliberately added, and he therefore thought that its selection as a test-object in this connection was unfortunate. Until we could isolate the typhoid bacillus itself (and no method that was altogether satisfactory had hitherto been invented for doing that) he feared we must remain in ignorance of its fate whilst undergoing the bacterial treatment. In places where the shellfish industry or the pursuit of bathing were too important to be discontinued, he would advise a trial of the method of sterilisation with chlorine that had lately been very convincingly advocated by Dr. Rideal. He would conclude by congratulating Belfast on the possession of so great an authority on the chemistry of sewage disposal as they had in his colleague, Professor Letts, who, in collaboration with another colleague of his, Dr. Adeney of the Royal University, had done work of fundamental importance on the subject they were met that evening to discuss.

Mr. James Alexander (Belfast) said that the works contemplated under the Belfast Main Drainage Act of 1887 were completed in 1894. The sewage of the city since then had been discharged by a wooden conduit into the estuary one mile from the pumping station. The results were somewhat of importance, and should have been energetically met by the Corporation. Prior to 1894 the

whole of the upper part of the lough was a healthy strand; this applied to upwards of 2,000 acres. Now that strand was covered to a considerable depth with sewage sludge, and had caused the growth and spread of a seaweed. The engineer for the London sewage works calculated on twenty-five tons of wet sludge for every million gallons of sewage in North London and Dublin. Using this reference for Belfast, there would be 300 tons of wet sludge per day to be got rid of. It would therefore be noticed that upwards of a million and a quarter tons had been discharged into the lough since 1894. The consequences had been, amongst others, that (1) the Whitehouse roads had been turned into a huge cesspool, and were not now fit for navigation purposes; (2) the Victoria Channel, the only means of approach from the sea to the docks, had got silted up with sludge; (3) the timber ponds and harbour had also been silted up. Those items he might class as material results. The Corporation was studying what could be accomplished by adopting a system of purification by bacteriology. This was estimated to cost £200,000, and would take three years to put into full operation. The advisers of the Corporation had overlooked the geographical position of its sewage outfall works, which was adapted for a precipitation system, where the effluent could be run into a body of water of several thousand times its volume, and the sludge put on a hopper barge at the works and discharged at sea. The precipitation system could be at work in *three months*, and the cost would be under £20,000. In conclusion, it should be stated that the stench from the slobland was at times almost unbearable and dangerous to health. Through this cause there were several actions pending for destruction of letting values of estates.

MR. JAMES MUNCE (Belfast) said that calculations had been made of the enormous deposits of wet sludge in the lough, but unfortunately the fact was forgotten or ignored that wet sludge contained about 90 per cent. of water, and those calculations were in consequence not correct. All experts knew that a method of purification which was suitable for one place might prove a failure in another. The Belfast Corporation was trying to find what was best for Belfast, and was hesitating before spending, say £200,000, until satisfied that the method proposed would be the best for the city. It was easy to spend the money, but it must first be provided, and such an expenditure was not agreed to freely; and then if the scheme did not prove a success the officials would get the blame. The peculiar trouble in Belfast was the enormous area of beach (or choblands, as they are called) which was exposed at low water, and on which the weeds collected and decomposed. The sewage nourished this weed, and the problem was how to get rid of the nuisance. How did such an enormous quantity of weed get on these banks? He had views of his own; he might be wrong but still they were at least partially true. These enormous deposits of weed on the shores having been more prevalent for the past twenty years, one looked for

some special cause. Up to that time the bulk of the shipping coming to Belfast was composed of sailing vessels and paddle steamers, and nearly all these were unable to reach the quays except at and near high water, and the paddles disturbed the surface of the water alone. Now there was a straight channel, deep water, and screw steamers which came up at all states of the tide. The propellers were low in the water and stirred up and set free the weeds and plants therein which were floated over the banks by the rising tide. This was the explanation of how a beach comparatively clean in the evening was often covered with weed in the morning and (if there had been an inblowing wind) as much as a foot deep in some places. Some people said it grew on the banks during the night! Needless to say, he did not agree with them. It was such deposit of weed which decomposed and smelt. The fresh growing weed did not smell. The Corporation engaged Professor Letts and Dr. Lorraine Smith to advise them as to the best means of dealing with the sewage, and to prevent the growth of weeds nourished by it, giving them a free hand. Most elaborate experiments and investigations had been made, and so far as the Corporation were concerned they had striven to get the best scientific advice on the whole question, in order that the expenditure could be justified. Everything so far confirmed bacterial treatment, and it was certain that when the works were completed even the gentleman who that evening tried to get them to go back 20 years would admit that the Corporation had been well advised in not taking his advice, and the ratepayers would feel they had got value for their money.

Mr. W. R. Kelly (Harbour Engineer, Belfast) said he should like to state that he did not agree with the advocates of the precipitation process that it was in any sense the best, or that which would be the most suited to the requirements of Belfast; nor could he agree with them as to its greater economy as compared with the bacterial system. They seemed to have satisfied themselves that the simple act of precipitation, by the use of lime, of the solid matters held in suspension, would amply purify the sewage. The fact, however, was that chemical precipitation, as applied to the treatment of sewage, succeeded in the accomplishment of one particular object only, and that was the separation of the solid from the liquid matters of which the sewage was composed, but the purification of the sewage was not of necessity secured thereby. If it be desired to arrive at a really high standard of purification for the effluent, which was eventually to find its way into the tidal waters (and this was, he believed, the desideratum, so far as Belfast and its neighbourhood were concerned), such could not be attained by the simple process of precipitation by the use of lime. The lime, although it would accomplish a comparatively rapid settlement of the suspended solids, and would yield an effluent more or less clarified, would at the same time dissolve a considerable proportion of the obnoxious solids hitherto held in suspension in the sewage; and, as had been well said by a distinguished practical

chemist, "this was apt to render the last state of the liquid worse than the first." Belfast was so circumstanced that a very extensive area of its estuary consisted of sloblands, which had proved themselves to be most inconveniently fruitful nursery beds for the pernicious seaweed known as *Ulva latissima;* and it seemed to him to be almost generally admitted that if this pest was to be entirely got rid of, the sewage which would find its natural outlet into Belfast lough, from whatsoever source it might come, must be so treated that the effluent should, before being permitted to enter the tideway, possess the highest possible standard of purification. That, he had no hesitation in saying, could not be accomplished by the process of precipitation by lime only. He did not intend to discuss the relative cost of the precipitation process as compared with that proposed by the City Corporation; he, however, felt satisfied that even were this system adopted, the cost would not end with the simple precipitation of the sewage and the disposal of the sludge. A more purified effluent would be demanded, and could not be secured except with an unreasonably excessive expenditure, and ultimately it might be found necessary to supplement the precipitation system with the bacterial method of purification.

ALDERMAN DR. KING KERR (Belfast) said after visiting Glasgow and several places in England with other colleagues on the Corporation, he was convinced that the precipitation process was a failure.

ALDERMAN SIR OTTO JAFFE (Belfast) said there was hardly a town in Great Britain better situated for bacteria beds than Belfast, as they had 72 acres for the purpose. He hoped that within ten years of the passing of the Act empowering the formation of the beds they would be able to fulfil their promise regarding the bacterial treatment of the matter coming through the sewers of the city.

MR. HECTOR F. GULLAN (Belfast) said that in dealing with the question of sewage discharge into tidal estuaries, it appeared to him that the two conditions which must be considered were (1) the formation of the tidal estuary, (2) the composition of the sewage and the nature of the trade effluents it contains. In reference to Belfast in particular, the meeting had already had the formation and general characteristics of Belfast lough fully explained, but in passing he would further point out that the river Lagan, which flowed into the upper end of the lough, and which formed the only source of supply of any importance other than tidal waters, was, a few miles above Belfast, a river of small dimensions, and delivered a very small quantity of water into the head of the lough. In contrast to the formation of Belfast lough, he would draw the attention of the meeting to the formation of the estuary of the Mersey. Here were likewise large stretches of bank at the mouth, exposed at low water, but although, from either side of the estuary, about two million inhabitants were discharging their sewage direct into its waters, no apparent nuisance arose therefrom. The banks still remained clean, and shellfish were daily gathered for human

food. In the case of the Mersey, however, it was found that at a point about three miles below Liverpool landing stage the width of the river rapidly narrows until opposite Woodside Ferry it was little more than half a mile in breadth, forming what may be termed a "bottle neck." From this point the tidal estuary gradually widened out, until at Eastham it was upwards of four miles across, forming a huge catchment area, to be filled with every rising tide; and with every ebb discharged with enormous velocity through the bottle neck at Woodside, and thence through various channels out into the open sea, carrying with it in its course the sewage of Liverpool, Birkenhead, and the populous surrounding districts, without fouling the banks and giving rise to complaints of bad smells and nuisances; all without the enormous initial cost and annual expenditure in upkeep of either sludge pits, filter beds, bacteria beds, with the pumps, presses, and plants in connection therewith. He submitted that where such conditions obtained as those in the estuary of the Mersey, having regard to efficiency with economy, no better system than direct discharge could be adopted. With regard to Belfast lough, the first question that arose was, were these conditions present, and if not could they be attained by engineering means? It appeared that after careful consideration it had been decided that no satisfactory system of direct discharge could be adopted with safety, and that purification in some form or other must be undertaken before the sewage could be allowed to flow into the water of the lough. It was here that the second question, in relation to the composition of the sewage and the nature of the trade effluent it contained, must be considered, and careful experiments undertaken before finally deciding on the exact form of purification that should be adopted. No two cities could be said to be working under exactly similar conditions, and to blindly accept the results obtained in the one as obtainable in the other was, in his opinion, only to court failure and heavy expenditure, which might have been avoided by careful experiments in the earlier stages. The sewage treatment required for Norwich would be of little use for Huddersfield, whilst a treatment suitable for Huddersfield would be both extravagant and inefficient in Norwich. In Belfast, as they were aware, the bacterial system had been adopted, and, as would be found on the visit to the Outfall Works, extensive experiments were being carried out by the City Surveyor to ascertain the most effective form of beds to deal with the Belfast sewage.

MR. G. B. WILKINS (Lisburn U.D.C.) stated that Lisburn, on the River Lagan, a short distance above Belfast, had tried precipitation for disposal of sewage; but the result was a failure, and they had been compelled by mill owners on the river to adopt a new system. In connection with this they had made inquiries all over the kingdom, with the result that they had adopted the bacterial system. The new works and disposal-beds were now in the course of construction under the supervision of Mr. Midgley Taylor. The

works when completed will probably be the largest of their class in Ireland, and it is expected that they will be a great success.

MR. R. M. YOUNG (Belfast) agreed with the reader of the paper regarding the vital importance of ultimate disposal of the effluent. He had heard Prof. Letts give his paper on *Ulva latissima* at the Glasgow meeting of the British Association, and agreed that the collection of the sea-weed from the foreshore at frequent intervals mitigated the nuisance greatly. When it was absent, as at White Abbey, there was little evidence of the sewage present in the water. At other towns adjacent to the lough, considerable quantities of crude sewage discharged into the tideway produced no evil effect, as there were no shallow tracts of foreshore for the growth of sea-weed fed by sewage.

MR. W. J. ROBINSON (Londonderry) said that after many years study of the question and long experience in dealing with sewerage works, he quite agreed with those who said that the precipitation process was a failure, and that the bacterial treatment when properly carried out was most effective.

The following note was read from PROFESSOR HENRY ROBINSON, M.Inst.C.E., who was unable to be present:—

"Those who are utilising tidal estuaries or the open sea to dispose of sewage must not disregard the lessons that have been taught recently. It was at one time thought that once the sea was reached dilution and oxidation resulted, and all trouble ended. We now know that the organic compounds of sewage are not thus rendered innocuous, but that pollution of the air and of the foreshore arise, which are injurious to the health of people exposed to them, whilst the pollution of sea-water causes injury to fish life of every kind. Two recent cases can be usefully recorded. One, in regard to air pollution (Lord Gifford v. Corporation of Chichester), arose through the discharge of a partially-treated effluent into an estuary. This was fought out in the courts and was decided against the Corporation. Another case arose from the pollution of oyster beds at Emsworth (Foster v. Warblington Council), where crude sewage was discharged into an estuary at a point where it would at certain tides (as I proved by float observations) pass over oyster layings. It was contended that the council had a prescriptive right to discharge into the sea, but the Court of Appeal, in giving judgment, answered this by stating that there was no prescriptive right to commit a public nuisance. Years ago an authority was required to adopt 'the best practical and available means' to render the sewage harmless, and very primitive methods of sewage purification were accepted. At the present time the 'available means' are numerous, and the adoption of the *best* requires impartial and intelligent consideration on the part of those who are responsible for the expenditure of public money."

THE VOLUNTARY NOTIFICATION OF PHTHISIS IN BRIGHTON:

Including a Comparison of Results with those obtained in other Towns.

By ARTHUR NEWSHOLME, M.D., F.R.C.P.,
Medical Officer of Health, Brighton.
(FELLOW.)

Read at Sessional Meeting, Brighton, October 27th, 1906.

AN essential condition of the Co-ordination of Measures against Tuberculosis is the knowledge of cases in which any action is needed as they occur. Without such knowledge all measures will be undertaken in the dark. I propose, therefore, to confine my remarks to the question of notification and the one fundamental provision, sanatorium treatment and training of patients, which, judging by the experience of Brighton, is not only indispensable to secure the success of notification, but is also the most important means of securing good results from notification. Notification of phthisis is not desired for statistical purposes. The death returns will probably always be the best index of the amount of this disease in a community. Hence I have always deprecated and nearly always refused notifications to which the condition was attached that visits to the notified case were not to be made, as such returns possess little public health value. For similar reasons, we definitely decline to accept notifications sent in respecting moribund patients, as the death returns are in such cases nearly as prompt as the notifications. These preliminary facts are stated in order that the weight to be attached to the Brighton figures given in Tables I. and II. and in Fig. 1 may be known.

In 1894 the voluntary notification of phthisis was begun in New York; and from 1898 onwards it was made obligatory on doctors in that city to notify all cases of phthisis attended by them. In this country the notifi-

cation of phthisis was advocated by Dr. Niven, then medical officer of health of Oldham, in 1893, and he presented a complete scheme to the Oldham Medical Society in that year, which unfortunately fell through owing to opposition. Voluntary notification of cases of phthisis was begun in January, 1899, in Brighton, and in September, 1899, in Manchester; and since then a number of other towns have adopted it. Table I. gives details as to some of the towns and metropolitan boroughs in which voluntary notification of phthisis has been attempted, and of the amount of notification received in proportion to population and to total phthisis.

At the beginning of 1904 compulsory notification began in Sheffield, under a local Act. In Table I. it will be observed that the notifications of new cases (in the Liverpool statistics no differentiation is named between new cases and cases renotified) are stated in terms of the population and of the total deaths from phthisis. The latter is the more accurate measure of the extent of notification; for the number of deaths from phthisis may be regarded as having a uniform ratio to the number of cases of phthisis in the different towns. Hence, in comparing one town with another, the columns giving the number of new cases notified to every 100 deaths from phthisis should be used. This is done in Fig. 1. It will be noted that New York, with its longer experience, has had the largest proportion of cases notified up to 1903. Unfortunately, I cannot give the returns since 1903, but possibly they would be higher than those for Brighton in 1906.* Sheffield, which is the only town with an experience of compulsory notification that can be tabulated alongside that of New York, has hitherto secured a much lower proportion of notified cases than New York; and, compared with towns with voluntary notification, Sheffield has a lower proportion of notified cases than Liverpool in one year of its experience, and a much lower proportion than Brighton in four years of its experience. It should be added that Sheffield has hitherto had only two complete years of compulsory notification of phthisis. The majority of the metropolitan boroughs which have adopted voluntary notification of phthisis during the last three years have not been so successful in securing notifications as the provincial towns mentioned above (*see* footnote to Table I.).

The different degrees in which voluntary notification of phthisis and

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* Since this paper was read, I have received the returns for New York in 1904 and 1905, and it will be seen (Table I.), that New York in 1905 had 205 cases of phthisis notified to every 100 deaths from that disease as compared with 252 in Brighton for the first nine months of 1906, and 207 for the whole year.

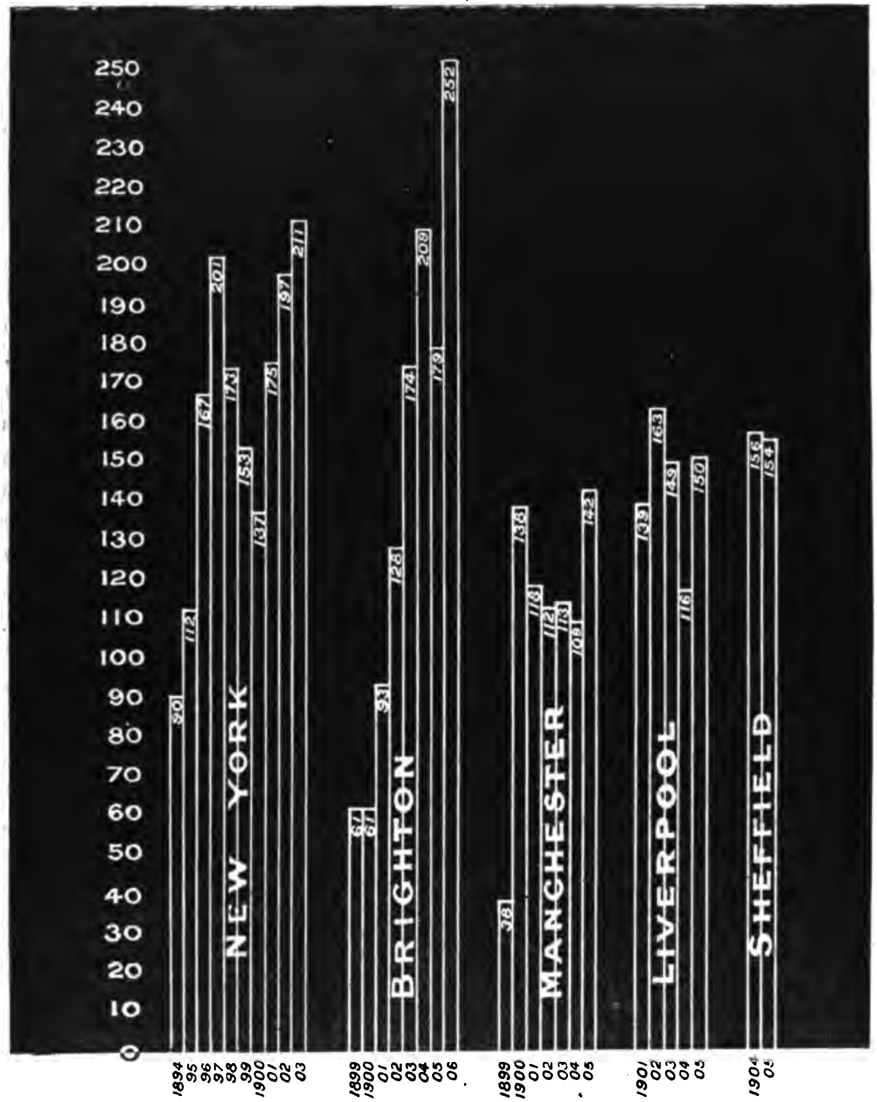

FIG. 1.—Number of cases of Phthisis notified in different towns, stated in proportion to the annual number of deaths from Phthisis in the same town.

(For continuance of the New York record during 1904 and 1905 see Table I., giving information received after this paper was read.)

still more in which compulsory notification of phthisis has succeeded, form an interesting subject for comparative inquiry; and although all the data required for an accurate judgment are not yet available, some indications may be gathered from a study of Table I. and Fig. 1. If we make the somewhat uncertain assumption that each death from phthisis means three new cases of phthisis in the same year, then Brighton in 1906 succeeded in obtaining the notification of 25 out of every 30 cases, New York in 1905 obtained the notification of 27 out of every 30 cases, Manchester in 1905 of 14 out of every 30 cases, Liverpool in 1905 of 15* out of every 30 cases, and Sheffield of approximately the same proportion of its total cases as Manchester. Probably there is in each of these towns a rather larger proportion of unnotified cases than these figures indicate.

Effect of facilities for Examination of Sputum on Notification.—Table II. sets out for the towns for which I can obtain the information the number of specimens of sputum examined for tubercle-bacilli in the laboratories which are municipally controlled or aided by the municipality. In Brighton during 1906, out of 156 specimens examined up to the end of September in which tubercle-bacilli were found, only 84 cases were subsequently notified, and the examination is regarded as strictly confidential unless the doctor sending the specimen subsequently notifies the case. As Liverpool, with very few specimens examined, has had as many cases of phthisis notified as Manchester, in which many specimens are examined, no direct relation can be traced between the use made of facilities for examination of sputum and the amount of notification.† Of the value of such examinations, when utilised freely and systematically by doctors, there is abundant evidence; and the routine examination of all expectorations for bacilli by every practitioner would go far towards securing early diagnosis and treatment of phthisis.

Effect of provision of Sanatorium treatment on Notification.—The chief reason why in Brighton voluntary notification has been as successful as compulsory notification in other towns, is because provision has been made for the sanatorium treatment of notified cases. This can be gathered from a careful comparison of the following statement of dates with Fig. 1:—

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* Doubtful, because of possible duplicate certificates.

† Since the above was written, Dr. Hope has kindly supplied me with information not contained in his annual report, and the same remark applies for Sheffield (Table II.). In both these cities a large number of specimens are examined in the pathological laboratories of the Universities.

BRIGHTON.

Voluntary notification of phthisis begun	Jan. 1899.
Four beds reserved at a sanatorium outside Brighton,	May, 1902.
Four beds opened for phthisis at the borough isolation hospital	July, 1902.
The number of beds for phthisis at the isolation hospital was increased to ten	Dec. 1902.
The number of beds at the isolation hospital for phthisis was further increased to twenty-five ...	April 3, 1906.

At first the patients were admitted for only a month, the principle adopted being that of training the patients in personal hygiene, and in the general management of their illness, rather than of attempt at cure. The wisdom of this plan has been fully justified by experience. The majority of patients has been found to have extensive lung disease, often with cavitation, when admitted to the sanatorium. Such patients commonly have several years of life before them, but the experience of other sanatoria shows that prolonged treatment of many months, or even over a year, is necessary to insure anything approaching to a cure even in cases in earlier stages of the disease. It is much more to the public interest to pass a large number of patients through the sanatorium and thoroughly train them in the hygienic requirements of their disease, than to treat a smaller number for a more protracted period. It is furthermore much more convenient for the patients, who often find it difficult or impossible to leave their families and work for longer than a month. Our experience is that advice as to the deposit and disposal of sputum given at home is commonly neglected; and that it is very rarely neglected by patients who have been in the sanatorium. As shown in Table III., we welcome readmissions to the sanatorium of patients whose health is again flagging. During the present year, 25 such patients have been readmitted. By this and other means, such as the provision of Japanese handkerchiefs, pocket spit-bottles, etc., and by quarterly visits at the home of the patient, we keep in sympathetic relationship with the patients, and insure the maintenance of precautionary measures against infection. On this point, the following card given to every patient when he leaves the sanatorium may be of interest:—

Advice to Patients leaving the Sanatorium.

1. The spit-bottle should always be carried in the pocket, and daily washed out with boiling water after emptying its contents down the w.c. At home if the bottle is not used, spit into paper or rag and burn this at once.
2. Be careful not to cough directly opposite to any other person. Always hold a handkerchief to your mouth when coughing. Change your handkerchief every day and put the soiled one into water.
3. In order to maintain a condition of good nourishment take a glass of milk with each of the three chief meals, in addition to the ordinary food.
4. Keep on taking cod liver oil each day until you have no cough, unless otherwise ordered by your doctor.
5. Do not take beer or other alcoholic drinks. Money thus spent is wasted.
6. Keep up the practice of sleeping with your bedroom door *and* window wide open. One of these without the other does not suffice. To keep warm wear plenty of woollen clothes.
7. It is imperative that you should sleep in a separate bed; and if possible have a separate bedroom.
8. Do not run the risk of inhaling dust if you can avoid it, either in the house or when at work, or in the street. Always insist on the "wet cleansing" of rooms, instead of dry dusting or sweeping.

Since the beginning of the present year our plans have been rearranged and extended. Under the Hedgecock Bequest to the Town Council, the interest of £20,000 has been allotted for ten years to the maintenance of Brighton consumptives in the sanatorium. We are thus enabled to devote 25 beds to this purpose. Of these 3 are for paying patients, 12 are Hedgecock patients, and 10 are directly municipal patients.

The Corporation provide the entire accommodation for the above patients in their isolation hospital, chiefly in what was formerly a pavilion for enteric fever, a very much smaller ward sufficing for the few cases of this disease which we still have.

The directly municipal patients are usually admitted for a month each, and are by preference men and women still able to work, and in connection with whom a month's rest, treatment, and training, can effect the greatest good to the patient and to others in preventing infection both of fellow-workers and of family.

The Hedgecock patients belong to the same classes. They must be unable to pay for their own maintenance in the sanatorium. Many of them are very advanced or even dying cases, for whom continuance at home is undesirable owing to difficulties as to nursing, or because there is a large

family and much danger of infection. Hedgecock patients are kept in the sanatorium for several months or for a shorter time, according to individual requirements.

We have at present under observation in Brighton 667 notified cases of phthisis. Table III. shows that the annual deaths from this disease number about 170. To every annual death four cases are under sympathetic and helpful supervision, which does not in the slightest degree interfere with the patient's ability to earn his livelihood. There has been much loose talk as to the risk of such visits to the patient's home: but with reasonable and tactful administration there is no risk. Mental confusion has arisen on the part of those unacquainted with the methods of work, because they have heard of cases where employers have discharged phthisical clerks, etc. Such an event is quite unrelated to notification. It is a natural, though lamentable and unnecessary, result of the discovery of the tubercle-bacillus by Koch and of the education of the public, which is going on whether there is notification or not.

Notification and the measures following on it in well-organised districts are the best means of preventing exaggerated fears of infection. In Brighton, for instance, out of the 667 cases of phthisis now under observation, 52 per cent. have spent at least a month in our sanatorium, and the public has the assurance that they are able and willing to take the simple precautions which alone are necessary to prevent spread of infection. This is striking evidence that infection from phthisis can be controlled, especially when it is remembered that we have only had 25 beds at the sanatorium since April last, the number for the previous four years having been only 10, for a population of about 125,000. This number, it should be added, does not include the 35 beds for advanced consumptives in the workhouse infirmary.

I am of opinion that the provision of additional sanatorium accommodation has been the chief cause of the great increase of notifications of phthisis, and also of the great increase in the number of specimens of sputum examined during 1906. Patients are eager to come into the sanatorium. Some of them even send specimens of sputum apart from medical advice. They are always referred to their doctors; or, if they cannot afford a doctor, the medical officer of health gives them an outpatient letter for the County Hospital. I take this opportunity of gratefully acknowledging the help of the assistant physicians at the County Hospital, without which the success of our system of notification would have been relatively small. A large share of each day's work of the medical officer of health and his medical assistant consists in interviewing

TABLE I.

Year.	New York (Compulsory notification), from 1898. No. of new cases of phthisis notified.	New York: No. of cases notified per 100,000 of population	New York: No. of cases notified per 100 deaths from phthisis.	Brighton (Voluntary notification). No. of new cases of phthisis notified.	Brighton: No. of cases notified per 100,000 of population	Brighton: No. of cases notified per 100 deaths from phthisis.	Manchester (Voluntary notification). No. of new cases of phthisis notified.	Manchester: No. of cases notified per 100,000 of population	Manchester: No. of cases notified per 100 deaths from phthisis.	Liverpool (Voluntary notification). No. of cases of phthisis notified.	Liverpool: No. of cases notified per 100 000 of population	Liverpool: No. of cases notified per 100 deaths from phthisis.	Sheffield (Voluntary notification to 1904. Compulsory notification 1904-05). No. of new cases of phthisis notified.	Sheffield: No. of cases notified per 100,000 of population	Sheffield: No. of cases notified per 100 deaths from phthisis.
1894	*4,166	231	90	...	...	...	...	...	...	...	...	...	...	...	...
1895	*5,824	312	112	...	...	...	...	...	...	...	...	...	...	...	...
1896	*8,334	436	167	...	...	...	...	...	...	...	...	...	...	...	...
1897	*9,735	502	201	...	...	...	...	...	...	...	...	...	...	...	...
1898	8,559	432	173	...	...	...	...	...	...	...	...	...	...	...	...
1899	8,012	399	153	111 [1]	91	61	425 [5]	78	38	...	...	...	29 [7]	8	6
1900	7,203	352	137	105	85	61	1,573	289	133	...	...	..	309	83	58
1901	9,130	436	175	153	124	93	1,339	245	118	1,797 [6]	283	139	282	74	49
1902	9,645	451	197	224	179	128	1,275	231	112	2,199	318	163	326	78	66
1903	11,089	505	211	316	253	174	1,357	245	113	1,874	262	149	519	122	91
1904	13,813	596	251	363	288	209	1,202	216	109	1,709	237	116	826	191	154
1905	15,036	629	265	308	243	179	1,406	223	142	1,861	252	150	741	170	152
1906	...	...	...	327 [2]	326 [3]	252 [4]	...	...	...	...	...	...	...	...	

* No statement as to duplicate certificates. After 1897 all duplicates are omitted. Voluntary notification 1894-97, compulsory afterwards.

[1] Notification began Jan. 7th, 1899. [2] To October 18th. [3] Estimated to end of year. [4] To October 18th.

[5] Notification began September 11th.

[6] Notification began February 14th, 1901.

[7] Notification one month during 1899.

With the above figures may be compared the following figures for Metropolitan Boroughs in which voluntary notification of phthisis has been adopted. They relate to 1903, and the number of cases notified are stated per 100 deaths from phthisis during the same year. The data are derived from Sir Shirley Murphy's Annual Report for 1903, pp. 40, 41: Kensington, 100: Fulham, 84; Hampstead, 62; Stoke Newington, 79; Finsbury, 52; City, 10; Southwark, 62; Lambeth, 80; Wandsworth, 80; Greenwich, 46; Woolwich, 95.

In 1904 the number of cases notified per 100 deaths from phthisis was: in Kensington, 81; Hammersmith, 89; Fulham, 77; Chelsea, 12; Westminster, 156; Stoke Newington, 60; Holborn, 218; Finsbury, 86; Southwark, 65; Bermondsey, 46; Lambeth, 68; Wandsworth, 41; Greenwich, 90; Woolwich, 90. (Annual Report of Public Health, County of London, 1904 p. 45. In none of these Metropolitan returns is there mention of duplication of cases.

would-be patients, and in investigating the origin of their illness. Visits are made to each patient's home every three months; and the inspector, who carries out this work with tact and skill, distributes according to instructions a considerable number of out-patient letters for the County Hospital, for the use of any relative of the patient who shows any evidence of failing health. It may be said, then, that it is possible with a voluntary system of notification to obtain as good or even better results than with compulsory notification, if in the former case one is able, and in the latter unable, actively to help the patient. This being so, the wisdom of the cry for compulsory notification of phthisis, *when a local authority is not possessed of means to give all possible help to the notified patients*, and is unprepared to expend the necessary amount of time and skill (involving expense) on the work, is open to doubt.*

In coming to this conclusion I am largely influenced by the consideration that, as I have elsewhere† urged with great detail of evidence, the segregation of consumptives, especially of advanced consumptives, in public institutions has been in the past and will continue to be in the future a predominating cause of the continuing and increasing decline of mortality from phthisis for which we are all working.

TABLE II.

Number of specimens of Sputum examined for Medical Practitioners by the Municipal Authorities in different towns (per 100,000 of population).

Year.	New York.	Brighton.*	Manchester.	Sheffield.
1894	3	...	...	...
1895	61	...	...	...
1896	97	...	...	...
1897	136	...	...	...
1898	147	...	...	...
1899	155	39	...	...
1900	173	70	48	152
1901	211	102	95	170
1902	216	135	107	176
1903	354	180	113	212
1904	414	226	118	216
1905	478	223	122	205
1906	..	448 Estimated to end of Year.	...	...

* The figures for Brighton do not include the specimens examined from patients in the Sanatorium.

In Liverpool, Dr. Hope informs me that during the last four years the average annual number of specimens of sputum examined has been 798, which is about 108 per 100,000 of population. The details for Sheffield given above have been added since the paper was read.

* An Inquiry into the principal Causes of the Reduction of the Death-rate from Phthisis during the last 40 years, with special Reference to the Segregation of Phthisical Patients in General Institutions, by A. Newsholme. *Journal of Hygiene*, Vol. VI., No. 3, July, 1906, pp. 304–384.

† POSTSCRIPT.—To prevent misunderstanding, I wish to repeat that, in accordance with what I have advocated for many years, I am strongly in favour of the compulsory notification of phthisis in districts in which a local authority can fulfil the conditions the absence of which is italicised above.

TABLE III.

Particulars of Cases of Phthisis notified in Brighton.

Year.	Number of Cases notified for first time.	Number of Cases re-notified.	Total number of Deaths from Phthisis in Brighton.	Population.	Cases treated at: Sanatorium outside Brighton.	Cases treated at: Brighton Sanatorium. New Cases.	Cases treated at: Brighton Sanatorium. Re-admissions.	Notified Cases. Left Brighton.	Notified Cases. Changed address and lost.	Deaths of notified Cases.	Wrong address given.	Cases living and under observation, Sept. 30th, 1906	Deaths of cases notified in a given year and dying in that or a subsequent year. 1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	Notified Cases in which death was not certified as Phthisis.	Specimens of Sputum examined. From Doctors in Brighton.	Specimens of Sputum examined. For Sanatorium.
1897 1898	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	21 for fourteen m'ths.	...
1899	111	2	180	123,327	...	...	...	6	43	57	7	...	23	15	1	2	1	Re	main	der	...	47	...
1900	105	4	173	124,148	...	...	...	15	21	58	2	9	...	24	20	2	5	un 3	certa 3	in 1	...	86	...
1901	153	9	164	123,478	...	...	...	22	42	62	4	23	...	...	35	16	6	3	1	2	4	125	...
1902	224	52	174	124,539	6	25	...	29	38	107	7	43	...	...	...	53	35	10	8	1	5	146	23
1903	316	82	182	125.405	...	96	3	22	69	112	9	104	...	...	...	...	62	30	16	4	5	227	111
1904	363	85	174	126,236	...	131	6	32	95	117	11	108	...	...	...	...	...	62	38	17	5	284	188
1905	308	102	172	127,183	...	130	7	31	57	83	3	135	...	...	..	...	...	...	51	28	3	279	104
1906 to Sept. 30	313	91	126	128,095	...	146	25	10	19	36	3	245	...	...	...	...	...	...	...	36	1	422 (to Oct. 11th)	196 (to Oct. 11th)
	1893		1345		534		41	167	384	631		667	23	39	56	72	109	108	120	89	23	1637	622

[*For Discussion on this Paper, see page 40.*]

DISCUSSION ON

CO-ORDINATION OF MEASURES AGAINST TUBERCULOSIS.

Opened by G. A. HERON, M.D., D.P.H., F.R.C.P., (MEMBER,)

At a Sessional Meeting, Brighton, October 27th, 1906.

BECAUSE of Sir William Broadbent's illness, I have been asked, at rather short notice, to open this discussion on the "Co-ordination of Measures against Tuberculosis." As I understand it, we are asked to discuss and, if possible, to suggest means by which the separate forces now scattered over the length and breadth of the United Kingdom, and more or less engaged in the desultory fight we now wage against tuberculosis, may be brought into orderly combination the better to carry out their common object which is to lessen, and ultimately to eradicate, that disease.

When a man of sense finds himself obliged to fight, his first care is to form as accurate an estimate as he can make of the strength of his foe. The foe whose strength we have to gauge is the most deadly of diseases. In England and Wales alone it kills in every year more than fifty thousand people. How many it disables no one knows. Even among those who outlive its onset not a few are maimed for life, never being again able to bear the strain of prolonged hard work. We know that the foe does its deadly work by passing from one victim to fasten on another, and that it cannot reach its new victim without our help. We know, too, that we give this help in no stinted measure, but in a measure that is full to overflowing. We know that overcrowding is the greatest help to the spread of tuberculosis from man to man, and we all know well that overcrowding in our cities, in our towns, and in our cottage homes, is one of the blackest blots upon our national life. All this has been common knowledge for twenty-four years! I do not speak of other nations in this connexion, because we have more than enough to do in this matter if we strictly attend to our own business. In the administrative county of London there are 1,019,546 tenements. Of these 149,524 are one-roomed tenements, and not a few of these often contain a man, his wife and children, and a lodger. Point out the part of any city or town where overcrowding of the kind just now indicated is commonest, and we know,

without further questioning, that there tuberculosis flourishes. And for years this also has been common knowledge!

The greatest destructive force of the disease springs from our neglect of the lessons taught by these three facts:

1. Tuberculosis always results from infection, and is, therefore, always preventible.

2. Overcrowding, more than anything else, fosters and spreads this infection.

3. The poor and the poverty-stricken supply the great majority of the victims of tuberculosis, because poverty drives the poor to herd together in dirty and overcrowded dwellings.

In the last three sentences I have endeavoured to indicate what I believe is the key to the stronghold of tuberculosis. This stronghold once destroyed we should, I hope, find ourselves within sight of the goal at which we aim, the extermination of tuberculosis. There would still be plenty left to be done, even when overcrowding had become impossible or infrequent. But as overcrowding becomes less dense, the mortality from tuberculosis will fall. The chief force of our attack on tuberculosis must, therefore, be directed against overcrowding.

But there are cases of tuberculosis where there is no overcrowding. These are not rare, but they are not very common. Such cases show us that the infection of tuberculosis sometimes does its work without aid from its greatest helper, overcrowding.

Now what forces have we with which to fight tuberculosis? Public opinion, education, medical science, men and women, money, legislation. These are the greatest of our forces, but they are scattered about the country and, for the most part, engaged in purely local work. One of their greatest and most pressing wants is co-ordination. By that means only can waste of force be very greatly lessened, and union among our forces secured for the attainment of the common good which we have in view, the extermination of tuberculosis.

How are we to co-ordinate public opinion? I know of but one sound answer to that question, and that is by educating public opinion. This can be done by the press, by the spoken and written words of men who have the ear of the people, by books, pamphlets, and leaflets; in Parliament; from the judicial bench when opportunity offers; from the pulpit, where opportunity can easily be made; by leaders of thought in my own profession: in short, public opinion can be brought into line on this or on any subject if men and women who have anything to say, and who can say it or write it, would but do what in them lies to open the eyes of the

people to the meaning of the fact, that more than fifty thousand people die every year in England and Wales from a disease which can be prevented.

But there is another service education can do to the cause we advocate. The elements of hygiene should be well taught to every pupil in our training colleges, and to all the older pupils in every school. Were this well done for, say, a score of years in all schools, and in all our colleges and universities, such a meeting as this would then have but to draw public attention to important facts touching the health of the people, and an educated public opinion would quickly insist on what was needful being done.

Medical science also has its part in the work, and no small part. I have said that eradication of tuberculosis is the object we have in view. It has been asserted that it is impossible to eradicate that disease. I will not now discuss that question; but I venture to say that we ought to aim at nothing short of the eradication of the disease. In this country malaria, cholera, typhus fever, leprosy, have been absolutely or practically eradicated, and the first three have been got rid of within living memory. It is, therefore, neither utopian nor unreasonable to believe that we shall, one day, eradicate tuberculosis. We do not know less about it than we know about any one of the diseases which have disappeared from our country. We know how tuberculosis spreads, and we know how to prevent its spreading. Medical science has shown that, if the disease is to be prevented, sanatoria must be provided in abundance, so that while the disease is curable those who have it in that stage may immediately be admitted to the full benefits of sanatorium treatment. I say *immediately* admitted, because to-day it is a common experience to find that people suffering from tuberculosis have often to wait six weeks or two months for admission to hospital or sanatorium. While this state of things remains a prominent fact we cannot hope to get rid of tuberculosis. Again, we must have infirmaries in which to accommodate incurable cases at short notice. The case of these poor people is hopeless; they must die and swell the huge death roll of this preventable disease. But those advanced cases are very dangerous to the healthy community, for it is from persons in this stage of the disease that infection is most apt to spread. Therefore the incurable cases should be sent to an infirmary, and there tended till they die. If this is to be thoroughly done there must be, at least, voluntary notification of the disease. By and by, when public opinion is ripe for it, we shall have compulsory notification. Dr. Newsholme has put this most important matter ably and clearly before us.

If sanatoria are to be provided in abundance, as they ought to be, people must have nothing to say to those who propose to spend £250 or more for each bed in a sanatorium, in addition to the cost of the land. The outside price of each bed ought not to exceed, in my opinion, £100.

Of what I called our greatest forces in the fight against tuberculosis, there yet remain three to be considered, men and women, money, legislation.

I am strongly of the opinion that private efforts to help on the fight are an essential part of our forces. For instance, it would, I believe, be difficult to overvalue the work of volunteer helpers, willing to go as visitors among the poor, and to tell them what to do when illness comes to their homes. The official visit from the authorities, whether medical or not, is one thing; a very different thing is the visit of the man, and still more so of the capable woman who offers help in time of sore illness, but represents no authority, but only that touch of kindness which makes the whole world kin. Sufficient help given in this spirit by tactful educated men and women would be one of the most powerful of our forces in the struggle with disease.

As to legislation: The fight with tuberculosis is far too grave and too great a matter to be thrown altogether upon the people unaided by the Government. It is among the highest interests of every man, woman, and child in the United Kingdom, or for that matter in the whole British Empire, that this preventable disease should be prevented. There is no one who is quite safe from its infection. But to try to eradicate tuberculosis means, among other things, to spend money. I submit that this money [if not all, at least much of it] should be taken out of national taxation, and the Government is the only power by which this can be done.

As I have already pointed out, we greatly need our efforts in fighting tuberculosis to be co-ordinated. We are here, I understand, to suggest some plan of co-ordination, or at least some plan by which a definite scheme of co-ordination may be laid before the country. All the points I have mentioned, and many more besides, ought to be carefully weighed and fitted into a large scheme, whose main features should be, I venture to suggest, a central body for the whole United Kingdom, in close touch with numerous local bodies, all working to the same end, the extermination of tuberculosis. The central body should consist of statesmen who are not mere party politicians, of lawyers, doctors, and last, but far from least in importance, of men of business capacity and training.

[*This Discussion also applies to the Paper by* Dr. A. Newsholme, *p. 26.*]

Dr. E. C. Seaton (Surrey C.C.), said the co-ordination of measures against tuberculosis was a rather wider subject than that under which he proposed to make some remarks. The advantages that Brighton had in the organisation and administration of its public health work placed it in a position to afford an object lesson to many authorities. The present system of dealing with phthisis (consumption) commenced some years ago. In 1899, as lecturer at St. Thomas's Hospital, he had first brought a class of advanced students to see the system in practical operation. That system had been developed and tested since, and he had lately had the opportunity of seeing it fully in operation. The measure of first importance was the improvement of dwellings, more especially those of their slums. They could not banish their slum populations, but they could banish the conditions under which they lived, so that they might claim, as one town even larger than Brighton *did* claim, that they now had *no* slums. He was certain that such work would not suffer under Dr. Newsholme's direction, and that it would always occupy a foremost place in his scheme. He had always been on the side of voluntary notification, and was more so than ever after having become acquainted with the working of the system, and seeing what had been accomplished in Brighton. The keynote of success here had been that sick people or their friends in notifying cases of consumption to the medical officer of health felt sure they *would be helped in one way or another, and that notification would not be to their detriment.* The part of the preventive system to which he had paid special attention lately was the sanatorium treatment of phthisis, and the provision made for that purpose in Brighton. He desired to dwell on this aspect of the subject especially, because there was no use disguising the fact that sanitary authorities, who already had experience of the cost of maintenance of large numbers of scarlatina or scarlet fever children, often for several weeks together, were fairly alarmed at the prospect of what the maintenance of phthisis cases, possibly in much larger numbers and for much longer time, might mean. Now in Brighton they could see at the excellent and well managed Poor Law Infirmary, and at the Sanatorium for Infectious Diseases, as nearly a complete system of dealing, not only with scarlet fever, diphtheria, and typhoid, for which the Corporation had statutory duty to provide, but also, and in buildings alongside with those for other infectious diseases, cases of phthisis. This class of sufferers, for reasons affecting both their own health and the public health, needed sanatorium treatment for a time. He was impressed with the boldness of this innovation in municipal hospital administration, and he immensely admired the intelligence displayed by the staff and the loyalty with which precautions were observed, which made the system safe and one approved of by local medical and public opinion. It would therefore be seen from what had been said that the question of cost must be judged by the cost of the whole Public Health Departm‹nt, *i.e.*, salaries of officers, laboratories for all purposes, including water analyses,

general sanitary staff, up-keep of offices, etc. Regarded comprehensively in this way it would, he believed, be found surprisingly moderate. The whole system struck him as one that worked like a machine, as the saying is, and he would add, a machine that did its work effectively at a moderate cost to the ratepayers, a consideration of the utmost importance. As an example of co-ordination of sanitary service he might venture, as a fairly old and experienced officer, and a lecturer for twenty years at one of the principal medical schools, to describe the Brighton system as both unique and instructive.

DR. F. R. WALTERS (Farnham) remarked that the chief predisposing causes of tuberculosis were probably debility from improper food, intemperance, infectious fevers, insufficient nutrition, dust, and dirt. These conditions could only be altered by incessant personal influence, and by practical object lessons such as are given at the Brighton sanatorium. People must be convinced that rooms ventilated only from one side are sure to be close, and may also be damp; that cold and draughts are not causes of phthisis; that ordinary dusting and sweeping stir up dust which may be infectious; that it is wrong to spit indiscriminately, and that all sputa should be destroyed. Much of this kind of instruction was best given in the homes of the poor by an intelligent woman. Wet cleansing should also be the rule in every railway station and place of public resort, and in every public conveyance. Every poor patient convalescing from an infectious illness should be able to go to a Convalescent Home; and his own home should meanwhile be kept up by sick pay from a benefit society or other source. Sputa should always be examined bacteriologically, whatever the ailment. By the time the symptoms of consumption are obvious the disease is already difficult to cure. Patients discharged from the sanatorium should either take up more suitable work, or the old work under more suitable conditions. Whenever a skilled worker is attacked with early phthisis, to change the old work for badly paid and unfamiliar unskilled work is a mistake, so that here the conditions of work should be changed. The chief reason why so much work is done in shop or bank behind closed windows was because the air is smutty, the worker may be insufficiently clad, and the room often overheated, and therefore draughty. Only early nonfebrile cases are fit for heavy manual labour, and not all of these, so that here the occupation would have to be changed for a more suitable one. A labour bureau is an essential part of the forces for preventing tuberculosis, and should be co-ordinated with benefit societies, sick clubs, sanatoria, and all local hygienic administration. He strongly advocated the plan of making all such preventive machinery centre round the local health authority.

DR. W. G. WILLOUGHBY (Eastbourne) said that he looked upon Brighton as the home of "co-ordination" in this disease, and was of opinion that co-ordination with regard to the measures to be taken in this disease might be summed up shortly as "notification, educational isolation, and the following up of cases

after temporary isolation." With regard to the first, notification, that in his opinion was very important; and although Dr. Newsholme had good results as showing what could be done by voluntary notification, Dr. Willoughby ventured to say that the results might have been better still had there been compulsory notification in Brighton. No doubt the public had not yet been educated up to compulsory notification of phthisis, but twenty years ago the same arguments were advanced against the compulsory notification of enteric fever, etc., as were to-day being advanced against compulsory notification of phthisis. As showing the satisfactory results of following up notified cases by co-ordinating measures in Brighton, Dr. Willoughby pointed out that according to the figures given in Sheffield with compulsory notification, there were three cases notified to every two deaths; whereas in Brighton, with voluntary notification, there were four cases notified to every two deaths; roughly equal to the compulsory notification results of New York. That they had had such a measure of success in Brighton was, in his opinion, due to the co-ordination measures described so fully that day by Dr. Newsholme. Incidentally Dr. Newsholme had objected to notification of cases where the medical officer of health was not allowed to take any steps he considered necessary to stop the spread of the disease; but it was useful, in Dr. Willoughby's opinion, to have figures as accurate as possible, and it was useful to know in what houses tuberculosis had occurred. If all cases were compulsorily notified, the disease would be so brought to the notice of the sanitary authorities that sanatoria would follow at a far greater rate than they were being erected at present. It was interesting to note in the return from Sheffield, where notification was compulsory, that in 1905, in every nineteen notified cases of consumption where death followed, one of the nineteen death certificates ascribed the cause of death to some other disease. The careful following up of the case after leaving the sanatorium was an important item in co-ordination; and suitable work should, if possible, be obtained for the patient, particularly where the patient's work had been a factor in the causation of his disease. Another important variety of co-ordination had been touched upon by a previous speaker, the co-ordination of the authorities. With regard to that, Dr. Willoughby suggested that not enough was being done. There should be co-ordination by sanitary authorities where each was too small to have a sanatorium of its own. A central body might be most useful for distributing plans and ideas, and a central nursing depot might be arranged; but this he did not intend to dwell upon, as it was "co-ordination of preventive measures" that the meeting was called upon to discuss rather than any other form of co-ordination.

Mr. J. F. Blacker (Brighton), while agreeing with all Dr. Newsholme had said, expressed the opinion that they had not begun at the beginning. In his view their preventive measures should start with the medical examination of all the children in all the schools. It struck him if that were done, and a register

kept of each child's personal and family history, they would be in a position to stamp out phthisis absolutely. The appointment of a medical officer of health for schools, and the removal of children from insanitary surroundings, were also very important in his view, although, of course, he recognised the difficulties that were in the way.

MAJOR WILKINSON (London) drew attention to the organisation of measures against tuberculosis at Lille, under the direction of Dr. Calmette. There was no notification of tubercle at Lille, but information of cases of this disease was obtained by means of a remarkable social organisation known as a "Preventorium." The chief object of the preventorium was to permit sufferers from tuberculosis to continue, as far as possible, their usual avocations, and at the same time to prevent the spread of the disease to others. With this object, arrangements were made for the discovery of cases of tuberculosis, the enquiry into the needs and circumstances of the patients and their families, their instruction in the precautions to be taken to prevent the spread of the disease, the supply of food, clothing, and even of special accommodation to necessitous patients, and the disinfection and cleansing of infected articles and rooms. For the purpose of making enquiries and of giving instruction with regard to anti-tuberculous measures, specially trained laymen, both volunteers and paid officials, were employed. These were chiefly of the working classes, as it was considered that they would be more in touch with the majority of those requiring instruction or assistance. The whole organisation was under the guidance of a medical man whose duties, besides the treatment of patients, included the bacterioscopic examination of suspected sputum. The preventorium acted as a filter for the sanatorium, for by its means patients were treated at their own homes in the earlier stages of tubercle, and in the later stages, when sanatorium treatment would be of little benefit, the preventorium protected the patients' households from infection. The expenses of the preventorium, as well as of an admirable sanatorium for consumptives at Montigny, near Lille, were defrayed by voluntary donations and subscriptions.

DR. HUGH STOTT (M.O.H., East Sussex Combined Districts) spoke of the advantage that would accrue from the medical officers in the boroughs working in harmony with the medical officers in the rural districts, so that when there was a chance of a patient being sent from the town into a rural district, the medical officer in the latter might follow up the treatment that had already been adopted. A great deal of effort was lost through lack of co-ordination.

MR. NIELD COOKE (Calcutta) said that it was encouraging to see the progress that had been made at Brighton, where the Corporation had provided for the treatment and education of the earlier cases and the segregation of the more advanced ones, all on a purely voluntary system without compulsion of any kind.

In the part of India where his work lay some of the controversial factors were absent, for there was practically no bovine tuberculosis; most of the people did not eat beef, they boiled their milk, and their infants were almost invariably breast-fed. In spite of this there were about 6,000 deaths a year in Calcutta from respiratory diseases, a large proportion of which was due to tubercle. So if, as had been said, sanatorium treatment formed an indispensable factor in the co-ordination of measures for dealing with the disease of the United Kingdom, where the question of causation had not been finally settled, it was *a fortiori* the line to follow in a Province where there could be no doubt that the infection passed from case to case in the house or workshop by the spray in coughing, tubercle-laden dust, and other subsidiary causes, apart from the predisposing cause of overcrowding, which could only be dealt with by a proper scheme of town improvement which would take years to carry out. For these reasons he advocated the establishment of a tubercular village on the outskirts of the town with an administrative block, some open tiled sheds for pauper patients, and cottages which could be rented by such as could afford to pay and where they could strictly observe the ordinances of their caste. Of course native opinion would have to be educated, as the co-operation of the people was essential to complete success, but the cases that the hospitals turn away for want of room would form a nucleus, and the Medical Officers of the Corporation could recruit others. The free ventilation of a sanatorium had no terrors in a warm climate, and there was nothing in the system incompatible with native life and custom, so he saw no reason why a start should not be made in Calcutta. The principal difficulty would be want of funds, but Brighton was an object lesson of what could be done from small beginnings, as he believed Dr. Newsholme commenced with only two beds.

Dr. J. Robertson (Birmingham) said there were many points in the paper which he could not agree with, and as it was more useful for the purpose of a discussion he would raise these, without mentioning the many points in which he was in agreement with Dr. Newsholme. In the first place it was implied, although not stated, that voluntary notification was as satisfactory as (indeed, that it was more satisfactory than) the compulsory notification of phthisis. Other things being equal, he did not think that that was the case. The facts on which this inference was based appeared to him to be insufficient. Dr. Newsholme had compared the results of certain sanitary administration in what might be regarded as a comparatively small town, and also a health resort, with several of the larger Midland manufacturing towns. His own experience was that it was possible in towns of, say, 100,000 inhabitants to have such intimate relationships with all the medical men in the town as to secure their willing co-operation and help in sanitary administration, while this was almost impossible or exceedingly difficult in the larger towns. For this reason alone it was probable that a successful medical officer of health would get good

results in a small town with voluntary notification as he would in a large town with voluntary notification. Compulsory notification was introduced into Sheffield mainly to protect the notifying medical men from liability to action for damages. During his experience in that town with voluntary notification, which was a distinct success, no friction arose; but in a large district it would be certain to arise sooner or later, and when it did it meant that a very great deal of damage would be done to the efforts for phthisis prevention. Such cases would occasionally crop up, and to prevent them compulsory notification was necessary. It was also unwise to compare their experience in this country with that in New York, where the methods of administration were so different. As to the effect of facilities for examination of sputum on notification, the statement made that apparently very few or no examinations of sputum were made in the municipally controlled laboratories in Liverpool or Sheffield was somewhat misleading. As far as Liverpool was concerned, probably few towns had done more to facilitate accurate diagnosis by means of such examinations, while with regard to Sheffield in 1901 641 examinations were made. He fully recognised the necessity of free use being made of such a laboratory, and for this purpose medical men were supplied with convenient apparatus for sending to the laboratory without having to call for them. He very strongly deprecated the statement in regard to the cry for compulsory notification. There was, he believed, a very large amount of information yet to be obtained in reference to phthisis administration, and notification must be, as Dr. Newsholme pointed out, the first step, and by itself it would be useless and a waste of money unless action were taken, but he did not think there were sanitary authorities so profoundly stupid as to rely upon notification without other action. The other steps which would have to be taken would gradually increase in number. During the seven or eight years that he had been dealing with notification in one form or another the preventive measures had increased enormously in variety and scope. In the prevention of phthisis while the active measures that follow notification are important, much more important were those indirect measures which had for their object the better nutrition (in the widest sense) of the individual. He was certain that a very large amount could yet be accomplished in bettering the health conditions under which the people lived and worked. The variations in mortality which took place among the different towns and among the different groups of workers were extremely suggestive. When dealing with these differences attention must be paid to many sources of error. In the case of Birmingham, for instance, the tubercular mortality figure of 184 represented the mortality among the central half of a population of a million. The city had overflowed its boundaries to the extent of nearly half a million people, who represented the healthiest part of the population. To a large extent these people appreciated what healthy living was, and were able to get away from the more central districts. This was only one of many examples of points which had to be taken into consideration in comparing towns. There was, of course, a differ-

ence between the central and outer districts of all towns so far as tubercular mortality was concerned, and this gave them an indication as to the cause of the high mortality. In the central districts they had to a larger extent than elsewhere the thriftless and dirty part of the population, and until something was done to effectually deal with thriftlessness and dirt, he felt that there would always be areas with high tubercular mortality in our towns.

Note by Dr. F. G. Bushnell (Brighton) who was unable to be present:—

Underlying the question of the co-ordination of measures for the combatting of tuberculosis is the large question of the co-ordination of all public health administration. The medical world has expressed in no uncertain voice its opinion at great meetings at Bradford, Exeter, Brussels, Paris and elsewhere, that the scientific problems of preventive medicine have such a bearing on our social life, not only from their special nature, but from their magnitude and their importance to the community as to call for a separate Public Health Department, with an expert minister of Cabinet rank at its head. There is, however, no sign of a translation of our wishes into practical effect, and that despite the fact that no substantial argument is ever brought forward to dispute the validity of our claim. The question of expense has been given in Paris as militating against such a creation, but when it is seen that such an organisation is merely an insurance against disease, it is clear that the price of insurance is worth paying, not only from the point of view of coin of the realm, but from that of far more important causes. It is, in short, an economic necessity, for the cost to the community is heavy when wage-earning individuals are incapacitated. History bears me out in saying that the individual with adequate powers at the head of a well organised department, who is a true advocate of his cause, will effect more in a year than has been achieved before in a dozen.

Dr. Newsholme (Brighton), in reply, said he agreed with Dr. Robertson in his opinion of the value of compulsory notification when local authorities had the means of following up the notification with proper measures: but he did not believe in indiscriminate notification to local authorities who were not in a position to help the patients. He agreed as to the importance of nutrition, but this was not a matter for the direct intervention of the local authority, except incidentally by the provision of sanatoria. With regard to what had been said about the proximity of the diphtheria wards to the consumptive wards at Brighton Hospital, there had never been a case of cross infection, so that there was really no risk. Referring to Dr. Seaton's remarks, he said that the Brighton Sanitary Authority had for many years past been working hard at the housing problem in the poorer and older parts of the town. They had cleared three areas under Part I. of the Housing of the Working Classes Act at a cost of £71,000, and 2,158 persons had been dishoused and rehoused. Under Part II. of the Act they had similarly dishoused and rehoused over 1,044 persons. In Brighton

during the last fifteen years one out of every twenty of the working classes had been rehoused in better houses than they had lived in formerly, and he doubted if any town could show a better record than that. Dr. Seaton's remarks as to the necessary considerations of expense were very important: but the experience of Brighton had been not only that it was the cheapest plan to spend money on those things, but in Brighton the cost had not been great. The total cost to the rates of the Health Department was 1·02d. in the £; the total cost of the isolation hospital, with debt charges, 1903 to 1904, was 2·28d., or 2¼d. in the £; and the clearance areas meant a debt to the town of 1 1-10 pence in the £ for about the next twenty years. Education cost 15·7d. in the £ in Brighton, not a penny too much; and the police cost 5·7d. in the £, so that sanitary and hospital administration was not being carried out on extravagant lines. Their twenty-five beds for consumptives were worked at a cost of about £1 a bed per week, not including expenditure which would go on whether the beds were utilised for consumptives or not. A large proportion of the annual expenditure came from the Hedgcock bequest. Overcrowding was, of course, at the bottom of the prevalence of phthisis, as had been said. There were two ways of reducing overcrowding or its effects: one slow, tedious, and often unsuccessful. This consisted in steadily enforcing the laws against overcrowding by domiciliary inspection. In practice it failed in a large proportion of cases, although it ought to be pursued with the utmost diligence. The second method of diminishing the evils of overcrowding was to remove those capable of conveying infection from overcrowded homes to public institutions, where their possibilities of mischief were minimised. This was being done by nearly all local authorities for the acute infectious diseases; it was being done in Brighton also for all the consumptives who lived in unfavourable homes. It should be remembered that in addition to the intentional accommodation for consumptives, most Boards of Guardians had during the last forty years or more been providing unintentionally a large amount of accommodation for the segregation of consumptives in workhouse infirmaries. In Brighton they had 30 beds for consumptives in the infirmaries, and these with the 25 beds in the sanatorium represented one bed for every 2,000 inhabitants, always occupied by consumptives. Such provision operated immediately in ameliorating overcrowding; the enforcement of the law against overcrowding acted slowly and imperfectly; and consumption spread when there was no legal overcrowding. Both means of abating overcrowding should be adopted with the utmost zeal.

NOTES ON LEGISLATION AND LAW CASES.

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COMPENSATION.—*Damage caused by exercise of statutory powers—Public Health Act, 1875 (38 & 39 Vict. c. 55), s. 308.*

The respondents, acting under the powers conferred by the Public Health Act, 1875, constructed an intercepting sewer, a pumping station, a sewage reservoir, and an outfall sewer, which were integral parts of, and together formed, one scheme of sewerage. The sewers were in part constructed on land the property of the claimant; the pumping station and the reservoir were constructed on land the property of other persons. The present value of certain portions of the claimant's land which were in proximity to the pumping station and reservoir was depreciated by reason of the contemplated user of that station and reservoir for sewage purposes:—

Held, that as the acts of user, the contemplation of which had caused the depreciation would be done on land not the property of the claimant, the damage was not sustained "by reason of the exercise of the powers" of the Public Health Act within the meaning of s. 308 of that Act, and consequently the claimant was not entitled to any compensation under that Act in respect of that depreciation.

HORTON v. COLWYN BAY AND COLWYN DISTRICT COUNCIL (Bigham J.) (1907) 1 K.B. 14.

HIGHWAY.—*Subsidence caused by mining operations—Action against wrong-doer—Measure of damages—Local government—Urban sanitary authority—Public Health Act, 1875 (38 & 39 Vict. c. 55) s. 149—Highways and Locomotives (Amendment) Act, 1878 (41 & 42 Vict. c. 77), ss. 10, 27.*

The defendants were the owners of a mine extending under a highway which was vested, under s. 149 of the Public Health Act, 1875, in the plaintiffs as the urban sanitary authority. While lawfully working the mine the defendants let down the surface of the highway, which the plaintiffs, acting on good faith and on the opinion of skilled advisers, restored to its former level. In an action to recover damages for the injury to the highway;—

Held, that the plaintiffs, in carrying out their statutory obligation to maintain the highway, were not restricted to making a road as commodious to the public as the original road, but were entitled to restore the highway to its original level, and that the cost of so doing was the measure of the damages recoverable from the defendants.

Judgment of Jelf J. (1905) 2 K.B. 823, reversed.

WEDNESBURY CORPORATION v. LODGE HOLES COLLIERY CO., LTD., C.A. (1907) 1 K.B. 78.

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THE AREA FOR SANITARY ADMINISTRATION,

By J. W. WILLIS BUND, M.A.,
Chairman, Worcestershire County Council.

Read at Sessional Meeting, Malvern, December 1st, 1906.

IT is over a quarter of a century ago that the present sanitary areas for England and Wales were constituted. In that interval new governing bodies have arisen and taken over the powers and duties of those that then existed. In some cases the areas have been reduced by the Local Government Act, 1894. In many ways circumstances have altered. New powers and duties have been given to authorities, quite irrespective of the wants of their areas. Sanitary science has advanced, but the legislature has not altered the law so that full advantage can be taken of the advance.

The Local Government Board is rigidly conservative, and regards the present as the best of all possible systems. It may be so, yet those who see the working of the sanitary Acts may be permitted to doubt if we have under the present state of things arrived, not at an ideal state of sanitary perfection, but at the best results that are capable of attainment with our existing powers and duties and our present authorities. I cannot pretend to any general knowledge of the subject, I can only speak from the experience I have gained in this county of the working of the existing laws, and I say that there can be no doubt that here, better work could be done than is done if a change were made in the areas of the sanitary authorities. Worcestershire in this respect furnishes a very interesting object-lesson: it is one of the smaller counties, yet from its peculiarities as to boundaries it possesses more authorities dealing with sanitation than those of much larger size.

The area of the administrative county is 473,328 acres, and the estimated population in 1905 was 385,610. It is divided into 32 sanitary areas, consisting of 2 county boroughs (Worcester and Dudley), 13 urban districts, and 17 rural districts. The county boroughs may be left out

for present purposes: this leaves 30 authorities (with no less than 506 members) to administer an area of 473,328 acres, with a population of 358,377 in 1901.

No one can say that the number of persons engaged in carrying out the law are too few; nor, looking at the funds at the disposal of these authorities as a whole, could it be said that they were utterly insufficient. Taking a 1d. rate as the basis over the whole area, it would produce £7,667 on the assessable value, the rural districts contributing £3,651, and the urban £4,016. It should, however, be stated that some of the urban districts are really only so in name; for instance, North Bromsgrove has an area of 10,588 and a population of only 5,688: while Yardley, which is a rural district in name, has an area of 7,590 acres and a population (in 1901) of 33,946.

When the figures that go to make up the total of £7,667, the produce of a 1d. rate, are examined, the evil produced from a financial point of view by a multiplicity of districts becomes apparent, and also the impossibility of getting good work done.

Out of the 17 rural districts, in no less than 8 a 1d. rate produces under £100;

In 4 districts a sum between £100 and £300;
" 4 " " £300 and £500;
" 1 " over £500.

If, therefore, each district was called upon to carry out the sanitary law effectively, it could only be done by raising the rates to an almost prohibitive sum.

Nor is this confined to the rural districts. In the 13 urban districts the figures give much the same results:

In 3 districts a 1d. rate produces under £100;
" 7 " " between £100 and £300;
" 2 " " " £300 and £400;
" 1 " " over £500.

It follows that the ability of the different sanitary areas to do useful work is to a great extent impeded by the fact that the small sum a 1d. rate produces, implies a very large rate in the £.

This fact explains the often expressed complaint that the sanitary authorities do nothing. It is, however, hard to see how any elective body can be expected to do much when the doing involves a shilling rate. The wonder is not that they do so little, but that they do so much. It seems obvious that the direct result of this number of small areas with low rateable values is to restrict sanitary work and to delay sanitary improvements.

That this is no inferential or theoretical statement will be seen from the following instance which recently occurred:—

A complaint was made to the county council of a very bad pollution to a brook, so bad that the farmers alleged that from drinking the water, the only available source of supply, their cattle were poisoned. The county council proposed to take steps to remedy the evil, but the local county councillors were furious, and a letter was produced from the sanitary authority protesting against being obliged to do anything for the next two years, as a loan the district had outstanding would then be paid off, and until that was done they could not increase the rates.

It is not easy to give the actual figures showing either the total rate for sanitary purposes for the various areas or the rate for ordinary administrative expenses and for paying off loans. But it may be taken that in the rural districts the rate averages not less than 4d., probably much more, and in the urban 8d.; in those districts which have large loans outstanding probably it is much more. This would give a sum of £46,732 (urban £32,128, rural £14,604) spent in the county, in round numbers £50,000. As stated, this is but an estimate, for some districts collect their sanitary rate with the highway rate, some with the poor rate, and some do not distinguish between special and general rates. All that can be said is at least £50,000 a year is raised for sanitary purposes.

The figures making up these totals are—

(A)—*Rural Sanitary Authorities.*

	1d. Rate.			4d. Rate.		
	£	s.	d.	£	s.	d.
1. Bromsgrove	404	18	0	1,619	12	0
2. Droitwich	388	16	8	1,555	6	8
3. Evesham	173	8	0	693	12	0
4. Feckenham	76	9	4	305	17	4
5. Halesowen	278	17	4	1,115	9	4
6. Kidderminster	270	18	0	1,083	12	0
7. Martley	289	18	8	1,157	13	8
8. Newent	20	10	8	82	2	8
9. Pershore	357	7	4	1,429	9	4
10. Rock	43	12	8	174	10	8
11. Shipston-on-Stour ..	98	8	8	393	14	8
12. Stow-on-the-Wold ..	18	16	0	75	4	0
13. Tenbury	99	16	8	399	6	8
14. Tewkesbury	63	6	8	253	6	8
15. Upton-on-Severn ..	307	13	8	1,220	14	8
16. Winchcombe	2	4	0	8	16	0
17. Yardley	756	6	8	3,025	6	8
	3,651	8	0	14,605	12	0

(B)—*Urban Sanitary Districts.*

	1d. Rate. £	s.	d.	4d. Rate. £	s.	d.
1. Bewdley	35	4	8	251	17	4
2. Bromsgrove	118	11	4	948	11	8
3. Bromsgrove (North) .	135	16	8	1,086	13	4
4. Droitwich	94	10	8	736	5	4
5. Evesham	124	0	8	992	5	4
6. Kidderminster ..	369	0	8	2,952	5	4
7. King's Norton ..	1,532	2	8	12,257	1	4
8. Lye	104	6	8	834	13	4
9. Malvern	520	16	8	4,166	15	4
10. Oldbury	433	15	4	3,470	2	3
11. Redditch	214	5	4	1,714	2	8
12. Stourbridge	267	6	8	2,138	13	4
13. Stourport	66	8	8	531	9	4
	4,016	6	8	32,130	13	4
TOTAL A & B	£7,667	14	8	£46,736	5	4

From these figures it clearly appears: (1) That it is not possible to ask for any increase of the sanitary rate in many of the districts except in the most urgent cases; (2) That the small areas delay if they do not prevent improved sanitation being carried out.

It becomes therefore a point of the highest importance to all who are interested in sanitary work to see if a change cannot be made that would enable the sanitary work to be carried out without inflicting any additional charge on the rates. Some change should certainly be made, and if a change in areas would do this, the sooner it is made the better.

In this county the areas are far too many. An outcry would doubtless be raised at taking away the independent existence of the areas, but it should be borne in mind that the existence of some of the areas is the result of an accident. Where the union lies wholly in the county something may be said for keeping it a separate area, but when a union lies in two counties, and it is only by the effect of the Local Government Act, 1894, that one or two parishes are formed into a new and separate area, the absurdity becomes apparent.

Out of the 17 Worcester rural sanitary areas no less than five comprise less than five parishes. These give the following results:—

	Parishes.	Councillors.	Areas.	Population.	1d. rate.		
Feckenham	3	12	15,204	5532	£76	9	4
Newent ...	2	3	5305	1182	20	10	8
Rock... ...	3	5	13,314	2150	43	12	8
Stow-on-Wold	2	2	2289	292	18	16	0
Winchcombe	1	1	1560	116	2	4	0

A better example of how not to do it can hardly be imagined. For sanitary purposes these areas are rendered impotent because no alteration in union boundaries was allowed to be made in 1894.

It may have been necessary in 1875 and 1894 to adhere to the old union boundaries: it cannot be so now when it is clear that such adherence is doing real injury to the health of the people.

The simplest and most obvious remedy would be to annex these parishes to the adjoining areas in the county, and it is difficult to see, except for the loss of rateable value to the unions from whom they are taken, why this should not be done. But this would only meet the outside of the question and leave the far more important subject, the small urban areas, untouched. This is a real and pressing question. In one case the Local Government Board have for some years urged that a scheme of sewerage should be carried out in an urban district with a population of 4,529, where a 1d. rate produces only £60 the cost of the sewerage scheme would be at least £10,000. A loan at 30 years would mean a rate of over 1s. The rates there are already high, and the district council resort to every possible device to avoid carrying out the scheme. Can they be blamed? Yet their medical officer says in his annual report: "I wish to disclaim all responsibility for the insanitary condition of the district, so long as my advice is ignored, or what is often worse, carried out in a way of which I do not approve."

The two instances cited, the one from a rural and the other from an urban district, point out the absolute necessity, if efficient sanitary work is to be done, of an alteration in existing areas.

As has been said, merely amalgamating the smaller with the adjoining areas will not meet the case; some much more drastic change is required.

But the matter should not be looked at merely from the financial side. The administrative side is equally important, here the multitude of authorities lead to great confusion.

The by-laws of these authorities are by no means uniform; the boun-

daries of the areas are purely arbitrary: on one side of a road you are prohibited doing an act which you can legally do on the other; go a little further down the road and the legality and illegality change sides as the boundaries of the districts change.

In the case of river pollution, an authority may be most desirous (I admit it is the exception to find such an authority) to stop river pollution, and may do its best to carry out the law. But the district above may think that pollution is preferable to rates and render the outlay of the law-abiding district useless.

In the case of smallpox or infectious diseases, one district will provide proper hospital accommodation, another will not, with the result that the measures that have been taken by the authorities to prevent the spread of disease may be rendered nugatory by an authority that prefers to run the risk of smallpox rather than increase its rates.

As to water supply, with the best intention in the world, a small area cannot afford a proper water supply, as the cost of bringing the water is so great, the authority have no compulsory power to acquire springs, and it is not likely Parliament will entrust to the small local bodies powers of compulsory purchase.

A number of other instances could be given; the above are only what have occurred in my experience in actual practice, and they all arise from the present system of having a large number of small independent areas. It therefore follows that both on administrative and financial grounds there should be a change, and while merging the very small rural areas into the adjoining areas would to some extent lessen the evil, it would not furnish an adequate remedy or give complete relief.

That the areas should be greatly enlarged will, I presume, not be denied. What will be raised as an objection is, that there must be local control: to some extent this is so, but it is by no means impossible to have larger areas with local control. In my view the county should be the area, and the sanitary work should be carried out by the county authority. The county should have the supreme control, and should work through local committees. The county being divided into a number of convenient districts, each should be placed under a local committee with a proper staff. The duties of the committee would be defined, and they would report at fixed periods to the county council as to the work they had done and the work required to be done. It would be the duty of the county council to supply them with funds, and see that proper sanitary work was carried out in a proper manner. At present this is not the case; too much reliance is placed on local talent.

Let me give two instances. A school was built for a school board not twenty years ago, by a local architect and a local builder. When the 1902 Act gave it over to the county council, the drains were not all they might be. The main drain for the school was laid first with 6 in. pipes, then with 4 in., and then with 6 in., and surprise was felt that it did not work as it should.

Another authority built a hospital, employing a local architect, but the hospital insisted on conforming to the law of gravity, and not to the plan of the architect.

The county council would also be able to deal with the large questions of water supply, river pollution, and sewerage on a broad basis; and the difficulties of works inside and outside the district, which is now continually occurring, would not arise or very seldom.

There would be one set of sanitary regulations for the whole county, and there might be some prospect of these being effectually and consistently carried out. We should not then see, what until very recently was the case, that one of the health resorts of certainly English, if not of wider celebrity, was actually without any sanitary by-laws whatever. There would be effective means of dealing with infectious disease and promptly isolating any cases. As all the hospitals would be under one authority, they could be utilised to the full extent without the great cost that now falls on the ratepayer, if cases from their own areas are taken in by another authority.

In a way something of the kind is done now, but it is done ineffectually. The district medical officers of health send a copy of their reports to the county medical officer, and he calls the attention of the sanitary committee of the county council to such work as requires to be done; the county council request the district to do it, and it may, or may not, be carried out. Cases could be cited where the county council have required a district authority to do some pressing sanitary work, and the correspondence with regard to it has extended for five years, and in some cases much longer.

The advantages of a central body working by local committees are obvious from an administrative side, and it is difficult to see why steps have not been taken to carry out such a change. Possibly the Local Government Board are afraid of the two great objections that may be raised to it, (1) the cost, (2) the opposition of existing bodies.

As to the cost, so far as can be seen the cost would be less than at present. If the present rates of 4d. over the rural and 8d. over the urban raise £50,000, one rate of 6d. over the whole county would produce £51,000.

If the rule in the Education Act, 1902, that the district should pay $\frac{3}{4}$ and the county $\frac{1}{4}$, were adopted for local work, it would work out at a county rate of $1\frac{1}{2}$d., representing £17,000 a year; and a local of $4\frac{1}{2}$d.= £35,250.

Thus, while the rural rate remained practically the same or only a fraction more, the urban would be considerably decreased.

The second objection is a more serious one, and would doubtless give rise to great opposition, as it is opposed to the trend of legislation in recent years, making urban areas with over 20,000 population practically independent. In Worcestershire there are only three such areas, and none of them can set up as models of sanitary administration. One has a sewage farm outside its district which is a cause of constant complaint from its neighbours as an intolerable nuisance. Another is under an injunction obtained by an adjoining county to restrain it from polluting the river, while the third does not see eye to eye with the county council in the question of isolation of infectious diseases and other matters.

Although none of the authorities would ever admit it, each of these districts could be better dealt with by an authority with a large area than an authority with a circumscribed area. Even, however, if they opposed and were successful in the opposition, that would afford no valid reason why the scheme should not be applied to all the other authorities.

Another ground of objection may possibly be that this would be a step towards getting rid of district councils and boards of guardians, and making the county council the sole governing body in the county, working all the different branches of administration through local committees. I am not sure that this is an objection, for I believe the more numerous the authorities the greater the cost of administration, and the only real reform in local expenditure will be one authority, one assessment, one rate.

That, however, goes far beyond this paper, which is only intended to raise the question that the present system of sanitary areas gives the least amount of efficient sanitary work at the highest cost; that it is actually prohibitive of necessary work in certain cases. If this is once admitted, and I do not think it can be denied, a remedy should be found for it. I have ventured to put forward one, but doubtless members of the Institute will be able to suggest other and better ones.

[*For Discussion on this Paper, see page 86.*]

PROGRESS IN WORKS OF PUBLIC HEALTH IN MALVERN DURING RECENT YEARS.

By WM. OSBORNE THORP, C.E.,
Surveyor and Waterworks Engineer, Malvern U.D.C.

Read at Sessional Meeting, Malvern, December 1st, 1906.

IN presenting this paper for your consideration, I must first ask for your kind indulgence, owing to the fact that it consists merely of a simple record of work of a municipal nature carried out by the Malvern Council, without describing anything of a unique or special character which lends itself to wide discussion. I am well aware that in many of the larger towns which The Royal Sanitary Institute visits, problems, sanitary and social, which are of the utmost import for the future well-being of our race, are discussed, whilst visits are made to experimental colonies, vast rehousing schemes, etc., which are more or less of exceptional interest and on an experimental scale. Here, in Malvern, we have no such attractions to offer you; our size and rateable value permit of no experiments, and we have, perforce, to stand by and watch the exertions of our larger neighbours before we follow on lines leading to what has, by thorough trial, proved to be unqualified successes. For all this, however, I hope to be able to show that the Malvern Council has not lacked enterprise in matters appertaining to the health and well-being of both residents and visitors, and also to uphold its reputation as a health resort and great educational centre. Whatever matter under this head is brought to their notice by responsible officials, it must be said to the council's credit that on being satisfied such work or improvement is necessary for the welfare of the inhabitants, no delay in carrying out what is required is permitted; so that I think it may now be safely said that Malvern will not yield first place to any other health resort in the kingdom, so far as works necessary for the maintenance of a high standard of public health is concerned. With these few remarks I propose to outline the progress made within the last ten years in Malvern to establish her in the front rank of places where the health of those who sojourn in their midst is of primary consideration.

The configuration of Malvern is peculiar, and makes it a difficult place to administer. It has an area of 5,436 acres, and a population estimated at just over 18,000. The town extends from a small district known as Welland at the south, through Malvern Wells and Great Malvern to the further end of Malvern Link at the north, a distance of over six miles. In addition, it extends through North Malvern round the extremity of the hills to West Malvern, and back through the Wyche Cutting above Malvern Wells. This entails the supervision of over 60 miles of roads, over 70 miles of gas mains, and a like amount of water mains, and over 100 miles of sewer, exclusive of combined drainage. To further add to the difficulties due to the extended nature of the district, there is a range of over 1,000 feet in levels.

Water Supply.

A description and history of the water supply of Malvern would make a paper far exceeding the length to which this must be confined, and would cover technical details of particular interest to the waterworks engineer, which, however, must be but briefly referred to here. Previous to 1894 Great Malvern depended on a series of small springs and covered reservoirs, but at that date the Camp Reservoir, with a capacity of over 51 million gallons, on the hills four miles to the south of Malvern, was opened. By this scheme water was collected on the eastern side of the hills and carried by gravitation to the storage reservoir by a series of catchwater drains, where it was stored, and after filtration, conveyed back to the town and distributed.

The population then to be supplied was well under 8,000, and no trouble was experienced till about eight years after the opening, when, by the addition of the extensive districts of Malvern Link, Malvern Wells, and West Malvern, it was readily seen that the reservoir could not sustain the heavy demand placed upon it. Before amalgamation, the Malvern Link Council had obtained parliamentary powers to supply their district by catchwaters on the western slopes of the hill, and these powers the Malvern Council put into force in 1899, carrying the newly-constructed catchwaters to join the existing ones on the eastern side, discharging to the Camp Reservoir. Unfortunately, the whole series of catchwaters have not been an unqualified success. Of necessity, to convey water into a reservoir by gravitation, which in turn supplies the town by gravitation also, they must be placed at a considerable height up the hillside, itself resembling the ridge of a roof, with no gathering ground on the top. The watershed which could thus discharge into these drains

is 587 acres, but though the rainfall averages 24 inches per year only 4·75 inches of that rainfall is secured for storage, or an average of about 170,000 gallons per day. This unfortunate result is doubtless due to the fissured and shattered condition of the igneous rocks forming the Malvern Hills, which allows a great percentage of the water to escape below the catchwater drains.

The position in 1902 was very critical, but owing to the energy displayed by my predecessor, Mr. H. P. Maybury, in obtaining private sources of supply and erecting temporary pumping stations, a water famine was averted, the wet season setting in fortunately some time earlier than usual. The Council was determined that if possible such an occurrence must not occur again, though the record rains and full reservoir of 1903 might easily have lulled it into a feeling of false security, but Mr. Maybury commenced work in sinking a borehole on land belonging to the Council near the gas works, Malvern Link. He had no reliable evidence of the depth at which the New Red Sandstone would be met with, but pluckily continued to a depth of 705 ft., when his efforts were rewarded by reaching the sandstone, the boring being continued to a depth of 878 ft., then the water rose to the surface. Trial pumping gave promise of a good supply with a permanent pumping water level 200 ft. below the surface, and plant was erected to raise the water to the North Malvern Reservoir through a new 8 in. main two miles long.

In 1904, when I succeeded Mr. Maybury, I noticed at Midsummer that the springs were rapidly failing, and that the storage in the reservoirs was quickly being depleted at the rate of over 1½ million gallons a week, so that as soon as possible pumping operations at the new borehole were commenced. Unfortunately it was found, after pumping had continued about a fortnight, that the water level sank below the 200 ft. limit, and in consequence only about half the quantity hoped for was obtainable. The autumn was also exceptionally dry and the reservoirs were practically emptied, so that negotiations had again to be entered into with owners of private springs and streams, temporary gas engines and pumps purchased, and mains laid to keep the supply going. This work was carried on continuously night and day, and frequent analyses taken to insure a good quality of water being maintained. It was naturally a time of greatest anxiety, but it is gratifying to record that never was the health of the district better. So serious was the position, that in January, 1905, I entered into arrangements with Messrs. Isler & Co., of London, to erect one of their most powerful air-lift plants for raising the water in the

borehole to the surface pumps, and by this means an additional daily supply of 60,000 gallons was obtained, the pumping level falling to 360 ft. from the surface; but at nearly prohibitive cost this was continued for ten months, and undoubtedly saved a serious water famine. The great depth to the sandstone and the weight of the huge mass of superimposed marl thereon, undoubtedly compressed the sandstone rock to such an extent as to prevent a sufficiently rapid infiltration of water to this borehole to make it a dependable source of supply in time of severe drought. In this predicament the Council considered three alternatives which the author submitted to them at the end of 1904, and they immediately decided to have the best geological advice obtainable, Mr. W. Whitaker, F.R.S., being consulted. After a thorough examination, he reported favourably on the proposal to obtain water from the large tract of New Red Sandstone about ten miles to the south of Malvern, and immediately after a suitable site was obtained at Bromsberrow Heath (Gloucestershire).

Unfortunately it was found necessary to obtain parliamentary powers, and as it was over two months after the date for deposit of Bills a serious difficulty arose, special leave being sought to introduce the Bill as a matter of urgency. Faced with this difficulty, and also with prospects of opposition and the uncertainty of the yield which would be obtained from the trial borings at Bromsberrow, the Council decided to leave no stone unturned, and instructions were then given to Messrs. Isler & Co. to sink a larger and deeper borehole (950 ft. deep) near the existing one at Malvern Link. This, by continuous work, was completed in nine months, but fortunately results at Bromsberrow were so successful that its use was never requisite.

Leave obtained to introduce the Urgency Bill for the Bromsberrow scheme, the author prepared the necessary deposit plans, and later the contract plans for the whole of the work. The Royal Assent having been given in August last year work was proceeded with immediately, two 15 in. boreholes 40 ft. apart were sunk to a depth of 200 ft., steel-tubed down to 60 ft., water being reached 34 ft. from the surface. Trial pumping showed a yield of 500,000 gallons per day from one borehole alone, the cone of depression only sinking 6 feet. Analysis by Mr. C. Duncan, F.I.C., County Analyst, and Mr. Bertram Blount, F.I.C., Westminster, proved the water to be of excellent quality and purity, and of medium hardness. Work in connection with the construction of pumping station, erection of pumps and machinery and pipe laying, for which some six miles of 10 in. pipes were required, proceeded with all speed; and within six months of commencement, Lady Grey, wife of Sir Henry Foley Grey

(Chairman of the Council), on the 29th March this year inaugurated the new supply, which has, in addition to the one previously existing, provided 60 million gallons during the recent prolonged drought. It has therefore been proved, without fear of refutation, that Malvern has now undoubtedly one of the most ample and pure supplies of any town of her size; and that a menace to her prosperity, which had been threatening for some years, had, it is to be hoped, disappeared for all time. Details of the necessary complicated system of distribution owing to the unique configuration of the district, a range of over 1,000 ft. existing in levels, does not concern us in this paper; but one peculiarity under the head of distribution worth noting is the fact that every house supplied takes the water through meter. It is a system which has much to be said for it in theory, but I doubt not that you gentlemen will, from your point of view, unhesitatingly condemn it. From a council point of view, it is expensive in the way of capital cost and upkeep of meters, yet the amount of water saved by this means is enormous. The average consumption of water is from 15 gallons in winter to 20 gallons in summer per head per day. Waste is immediately checked, and the supply carefully regulated, whilst being a real garden city, where practically every house has its garden large and small, the ticking of the meter is recollected by consumers when the hose pipes are busily at play, and so a wholesome regard for the value of water when it is most required in the summer months is forcibly brought home to all.

Sewerage and Sewage Disposal.

The configuration of the Malverns does not permit of a common outfall for its drainage, and therefore it is necessary to deal with three particular drainage areas. West Malvern is provided with a thoroughly modern system, constructed when the district was under the control of the Malvern Link Council, with Mr. Baldwin Latham as engineer to the scheme. The gradients are exceptionally steep, but the flow is a comparatively small one, about 50,000 gallons per day. The farm is in the valley and consists of seven acres of land of good quality and undrained. The sewage passes through small settling tanks, the sludge after precipitation passing into sludge tanks, where it is mixed with soil and disposed of to neighbouring farms. The liquid passes to the land through half round channels, and the effluent is discharged in a fairly high state of purification into a small brook. Rye grass and coarse root crops are grown, which about pay for the labour spent upon the farm.

Malvern Wells, at the southern end of the district on the eastern

side of the hills, also has a thoroughly efficient modern system of sewerage and sewage disposal, carried through, after this district was amalgamated with Malvern in 1896, by Mr. H. P. Maybury. A farm consisting of forty-eight acres was obtained below Malvern Wells near the Midland Station, ideal in every way for its purpose. The subsoil is of gravel, through which the sewage, after precipitation in two sedimentation tanks, percolates, passing off into a stream in a high state of purification. The population draining to this farm is under 3,000, and at no time has the land appeared sewage sick or overworked. Rye grass, coarse root crops, and some cereals are grown. The farm is also utilised for the rearing of a few colts, and as a hospital for horses employed in various departments under the Council. There is also at this sewage farm a very neat and compact experimental series of miniature disposal works laid down by the Worcestershire County Council, consisting of (1) septic tank and sprinkler filters, (2) double contact filters, (3) Scott-Moncrieff filters, whilst different media were also tried in the filters.

Analyses by Mr. C. C. Duncan the county analyst and his subsequent report make interesting reading, covering as they do a considerable period, the general result showing that the septic tank followed by sprinkler treatment on a fairly fine-graded filter of coke or clinker free from dust gave the highest standard of purification.

Coming to the Great Malvern District, most of the area has gradually been resewered from time to time, and manholes provided at all necessary points, so that little fault can be found except in the fact that in the older portion of the town a separate storm-water system has not been provided, and in times of heavy rains a great volume has therefore to be dealt with at the outfall. As before stated, in 1898 the Malvern Link district was included in the Malvern Council's area, and as the drainage of this added portion at that time was most unsatisfactory, a new scheme at a cost of £18,000 was immediately put in hand by Mr. Maybury. Practically the whole of this area was redrained, the old sewers being utilised for storm-water. It was decided not to multiply the sewage farms, therefore a main outfall sewer was laid across to the existing Great Malvern sewage farm at Barnard's Green, which it is proposed to visit shortly. This farm originally consisted of 39 acres, and was laid out in 1878 to take the Great Malvern sewage. And on the addition of the Malvern Link district, the sewage from it was treated in settling tanks before passing to the land, and an additional eight acres of land added. The land, however, consists of a heavy compact tenacious

marl and was never suitable for broad irrigation, the sewage practically flowing over the surface instead of through it.

Early this year the Council decided to put this farm in order, and the scheme prepared by the author was approved of by the Local Government Board, and work put in hand immediately.

Briefly, the proposed method of treatment consists in uniting the two outfall sewers from Great Malvern and the Link, discharging 600,000 gallons daily dry weather flow, and carrying them through a small detritus tank, thence to a screening chamber and storm overflow, and into the existing tanks constructed to take the Link sewage. From these tanks it will pass by dipped pipes into two large tanks of nearly half a million gallons capacity, constructed of Ferro-concrete by the Liverpool Hennebique Co. The effluent then flows either to a large circular filter 130 ft. diameter, fitted with Candy Whittaker's mercurial seal distributor, or to a series of rectangular filters, fitted with Messrs. Jones & Attwood's fixed spray distributors. The filtering material, 5 ft. in depth, consists of either crushed clinker from the destructor or chippings from the Council's quarry. They are graded to sizes varying from 2 in. to $\frac{1}{4}$ in., washed and free from dust.

I am strongly of opinion that in many cases far too little attention is paid to this essential part of the filter, and that the proper grading and washing of the material is necessary and repays for the trouble and extra labour involved. The whole of the beds are covered with Stiff's patent drainage tiles, permitting of thorough cleansing and aëration of the bottom of the bed.

The revolving distributor is notable, I believe, in being the largest Candy Whittaker distributor in use, whilst the sedimentation tanks are also the largest sewer tanks in the country constructed of reinforced concrete. The walls are only 5 in. thick though 12 ft. 8 in. high, so the vast saving in material and time over the old method will be readily seen. The engineering principles involved in its design or construction are of great interest, but cannot be entered into in this paper.

One difficulty which has to be dealt with is, that at times a considerable discharge into the sewers takes place, at the Council's Gas Works, of liquor from the sulphate of ammonia plant, which has been proved, on experimental filters, to destroy the activity of the filter completely, all purification practically ceasing. The gas engineer and myself are now engaged in investigating the merits of a patent for purifying this discharge before it enters the sewers.

The sewers of the district are ventilated (1) by shafts placed up the hillsides above dwellings, (2) by open covers in fields away from roads or paths, (3) by a number of Webb's patent street gas lamps.

Probably in no town is more thorough supervision of the sewers given, all manholes being opened and inspected regularly once a month, those on flat lengths being examined fortnightly.

Isolation Hospital.

These buildings are situated just beyond the northern boundary of the district, well away from the town. They were carried out under the supervision of my predecessor, Mr. H. P. Maybury, during the chairmanship of Dr. H. E. Dixey, who, as a medical man, displayed the greatest activity and interest in this valuable and necessary hygienic adjunct to the town, which was opened for use in May, 1901. The buildings are plain, but admirably suited for their purpose, and consist of an office block, containing laundry, disinfector, mortuary, etc.; diphtheria block, with accommodation for 4 males and 4 females; scarlet fever block, with accommodation for 4 males and 6 females; the typhoid fever block accommodates 2 males and 2 females; whilst an observation block or private ward of similar size is provided. A large and commodious building is the matron's house and administrative block, whilst a discharging block and porter's lodge stand at the entrance. The hospital is supplied with the town water; and the sewer was extended specially to take the drainage therefrom.

Refuse Destructor.

This valuable addition to the sanitary improvements of the town has been in use less than three years. It consists simply of a pair of Wilton forced-draught furnaces under two Lancashire boilers 30 feet by 8 feet, which provide the steam power for the electricity works. The refuse previously had been deposited at convenient tips close to the town, but these are now abolished, and, with the exception of a small quantity from the most remote corners of the district, the whole, amounting to about 3,200 tons per annum, is destroyed here, the clinker at present being utilized at the sewage works.

Sanitary Works.

A paper of this description would not be complete without reference being made to the important work carried on by Dr. Fosbroke, D.P.H., County Medical Officer for Worcestershire, and Medical Officer of Health for Malvern; and to Mr. Henry Hillyard, the Council's energetic Sanitary Inspector. The good work of such officials does not show

upon the surface, as is the case of work of an engineering nature, and the vast amount done for the public good is unfortunately seldom fully recognised or understood. Large numbers of improvements have been carried out upon private properties, insanitary and dilapidated dwellings closed, whilst others have been restored and put into good order. At one time practically the whole of the inhabitants of the added districts were without town water and dependent on shallow wells. Extensions of the mains have been made, so that there scarcely remain any houses but which are within easy reach of the town supply. This has allowed the Council to take action in respect to the wells before alluded to, and samples of the water have been taken and analysed where the slightest suspicion existed, and if found unsatisfactory condemned and the town supply laid on. The extensions of the mains have also rendered possible the ample supply necessary for frequent flushing of sewers, sanitary conveniences, etc., whilst the important question of flushing appliances in all closets is being strongly enforced.

Private drainage has also received very close attention, and it is probable that there is no work that has added more to the security and health of the district than the very successful efforts that have been made in this direction. During the past nine years over one-third of the private drainage and sanitary conveniences of the houses within the district have been entirely re-constructed, whilst the majority of those remaining have had many improvements and repairs effected.

The work has also received very close supervision, and the standard obtained has been excellent. All drainage work is, where practicable, tested with water, and the Council grant special certificates as to the sanitary conditions of premises, provided their full requirements are complied with, which are somewhat more exacting than the bare requirements which can legally be enforced by notice under the Public Health Acts or by the by-laws.

It is gratifying to both Council and officials (over whom Col. E. L. Twynam, as chairman of the Sanitary Committee, has so ably presided for many years) to record that the death rate last year was only 8·7 per 1,000, a rate only slightly more than half the average for England and Wales, and which doubtless will be difficult to improve upon here, or in any other town of the size; a result which also undoubtedly upholds the wisdom of the Council's untiring action in leaving no stone unturned to remedy any defect apparent in matters appertaining to the health and sanitary condition of the district under their charge.

[*This Discussion applies also to the paper by* MR. J. W. WILLIS BUND, *page 49.*]

DR. J. ROBERTSON (M.O.H. Birmingham) said the subject which Mr. Willis-Bund had brought forward was a most important one. They must realise that, while the larger towns and many of the middle-sized towns were doing good work, in the smaller districts there was the hindrance of the lack of funds, and in many places a lack of men with sufficient knowledge to carry out existing laws and by-laws, and to adopt the sanitary progress of the times. In Birmingham, and other large towns, they had a much cleaner milk supply, as a general rule, from cowsheds inside the town than from the cowsheds outside the town, despite the difficulties which had to be faced. If sanitary administration was in the hands of the county council there would not be local control, as local control was understood. The English liked to have local control in sanitary administration, as distinguished from the central control one heard so much of in Germany. That something ought to be done would be acknowledged by everybody who had taken the trouble to study the question. The time was ripe for reform. The Local Government Act had been tested, and they now found that some of the small rural authorities were allowing matters to drift, leaving inhabitants of rural districts in more or less unhealthy conditions, and endangering to some extent the people in the towns.

MR. W. WHITAKER, (Croydon), remarked that Mr. Willis Bund had said that any attempt at joining some of the small areas would cause an outcry. His experience was that, whatever they did or did not do, they caused an outcry. It was their business in life to cause an outcry. Malvern itself was an example in favour of amalgamation. In matters of water-supply it was not so difficult to provide for big places; it was in the small districts that trouble began, and often it was only by combination that a good supply could be got.

DR. H. E. DIXEY (Great Malvern) could not agree with all Mr. Bund's deductions. Unless local committees were given administrative and executive power he did not think they would get men to take an interest in the work. There was one department of sanitary work which he thought could be centralised with advantage: the county medical officership. A county medical officer, with two or three assistants, could take over the work now done by the district medical officers, who sometimes found it difficult under present conditions to carry out their duties, and were badly paid for the work they had to do.

MR. JAMES WOODYATT (Malvern Urban Council), dealing with the point raised by Dr. Robertson as to the milk supply, said that what was sometimes thought dirt was absolutely beyond the control of the cowkeeper. He was

emphatically of opinion that what was thought dirt was often excreted through the cow's udder, and was not extraneous matter. It was unfortunately true that extraneous matter frequently found its way into the milk. The secretion he referred to was found only when the cows were being fed on concentrated foods (meals or cake), and not when the animals were supplied with green food, either at pasture or on the ensilage system. His contention was a startling one, and altogether opposed to theory, as it was generally understood that the assimilative properties of the food are absorbed in solution; but he knew something of the internal anatomy of a cow, and made this assertion after the closest investigation.

MR. J. E. WILLCOX (Birmingham) said that in rural districts the parish was the unit for works of water supply and sewage disposal. There were many parishes in Worcestershire where a penny rate produced less than £20; consequently sanitary work was almost prohibitive. The Local Government Board's requirements were the same for rural districts and small parishes as for large towns, and it was largely a question of cost which prevented sanitary reform. They could not wonder that rural districts hesitated to incur expenditure, and it was very easy for them to procrastinate for many years. A large proportion of the members of rural district councils were agriculturists, who were practically called upon to pay rates for works from which they derived no benefit. The only way to overcome present difficulties of water supply was to group villages, but there would always be local jealousies in regard to the question of representation. One factor which prevented the carrying out of waterworks was the cost of springs. Twenty years ago it was different, but to-day land owners knew the value of water, and the charges they asked for springs were practically prohibitive. It would be of great benefit if the county council could have power to acquire springs for water supplies and land for sewage disposal works.

MR. J. W. WILLIS BUND (Worcester C.C.), in his reply to the various speakers, said his idea was that the sanitary committees should consist of the local county councillors and certain co-opted members. The county council should have supreme control. As to district medical officers, they were in a difficult position. He knew several cases where they had made reports to their authorities, recommending measures of sanitary reform, and the reports had been shelved. It would be a great advantage to the country if these local authorities would take a more enlightened view. As to milk, he had served on a departmental committee, which heard evidence that the regulations made by some authorities with regard to the milk supply were such that the small owners were unable to carry them out; and they had either to give up keeping cows or were obliged to sell their property to some rich landowner, so that new buildings might be erected to enable the milk trade to be carried on. As to Mr. Willcox' points with reference to water supply, he thought that if nothing else

in sanitary matters was handed over to the county council or some larger body, water supply ought to be. He was not certain that even the county council was large enough for it. Once they began tapping underground water, they never knew what interest they would affect. When the Severn Tunnel was made a number of wells in the district dried up. There was a case in Worcestershire in which a number of villages united to get a water supply, and one effect of taking this large quantity of water was that the brooks had dried or the supply had been so reduced that there were no fish, and the brooks had become something like sewers, having lost their scouring power. The question ought to be dealt with on comprehensive lines, and he hoped to see the Government take steps not to allow towns or villages to grab the springs that still remained open. Some large body should regulate the supply to the different districts.

Mr. W. Osborne Thorp (Malvern), replying to Mr. Willcox, said it cost the very high amount of 13d. per thousand gallons to raise water from the depth of 360 feet by air-lift. As the pumps were in a dug well, it was impossible to lower them, and they had to rely on the air-lift. The second borehole was not directly connected, and no experiments were made with it. He agreed that there was a great difficulty with regard to the revolving distributors. The question of time was immaterial. He did not believe in leaving things to chance, and he had adopted a system which he thought would get over the difficulty mentioned. Trays were attached to the arms of the distributor, and the discharge then flowed out of small weirs in the trays. By that means it was easy to test the discharge from the tray, and, if necessary, to enlarge or decrease the size of the holes in the distributor in order to give the requisite flow for the position of the bed in which a particular tray was fixed. The flow was also tested on the bed by a small gauge box sunk level with the top of the filtering medium, by which means it was readily ascertained that the proper flow per square yard was being actually discharged on any particular portion of the bed.

ABSTRACT OF THE REPORT ON THE TESTS OF GAS STOVES

Carried out by the Coal Smoke Abatement Society in May and June, 1906.

By JOHN S. OWENS, M.D., A.M.Inst.C.E., F.R.G.S.

THERE were 25 different stoves tested, including 5 flueless stoves. The rooms were of about 4,000 c. ft. capacity; with unplastered walls of brick; ceilings and floors of coke breeze concrete; no furniture. The flues were nearly all 68 ft. high and 9 inches in diameter, lined with stoneware pipes.

The tests lasted in each case for 8 hours.

The flues from the gas stoves passed through sheet iron plates, fixed against the opening of the main flues and closing them.

The object of the tests was to determine (*a*) The value of the stoves considered as apparatus for heating the air of rooms; (*b*) Whether the heating was accompanied by any vitiating effect on the air.

The following data were obtained —

1. The number of cubic feet of gas burnt per hour by each stove.
2. The composition and calorific value of the gas used.
3. The temperature of the air in the corridor whence it was admitted to the rooms.
4. The temperature produced in the rooms under test.
5. The temperature of the escaping flue gases.
6. The percentage of CO_2 in the flue gases.
7. The velocity of the current in the flues, as determined experimentally.
8. The corridor and room air was analysed for CO_2, CO, and general impurities.
9. The humidity of the air in the corridor and rooms was taken by wet and dry bulb thermometers.
10. Presence or absence of smell was noted.
11. Musk plants were placed in each room, and their state noted at intervals during tests.

For the purpose of determining the percentage by volume of CO_2 in the flue gases an ordinary Bunte's burette was used.

For detecting CO in the room air I used the hæmoglobin test, shaking up a sample of the air to be tested with 5 c.c. of diluted blood.

For estimating the CO_2 in the rooms and corridor Lunge and Zeckendorf's apparatus was used. It was found to be rather too slow; too much time being occupied on each test.

Dishes of potassium permanganate solution, exposed in the rooms and corridor, were used as comparative tests for general impurities, such as unburnt gas, etc.

The flue velocities were obtained by observing the time taken for a volume of smoke, introduced suddenly into the stove, to reach the top of the flue. The smoke was produced by a small pinch of black gunpowder, and the time of travel noted on a stop-watch. I found this method gave surprisingly accurate results; another advantage being that a single observation usually occupied less than one minute.

Some curious results were obtained bearing on the production of draught in a chimney by the wind. When no fire or stove was fixed in a flue, the draught appeared to depend entirely on the wind; if a strong wind was blowing a strong draught was produced, and *vice versâ*.

On the other hand, when a stove or fire was fixed in a flue the draught appeared to depend entirely on the stove or fire, and little, if at all, on the wind. It would seem as if the flow of the hot gases from the top of the flue interfered with the action of the wind blowing across the top. Whatever the reason, a flue, similar in all respects to those having stoves, but open to the room, altered its draught with every variation of wind, the draught of the stoves being at the same time practically unaffected by changes of wind.

In the report published in the *Lancet* of Nov. 17th last, the results are given chiefly in tabular form. These results may be briefly summarised as follows:—

Of the 20 stoves having flues, the gas consumption varied from about 23 to 66 c. ft. of gas per hour.

The draught produced varied from about 1,000 to 5,000 c. ft. per hour.

The time from lighting the stove until the room reached a fairly steady temperature was from 1 to 3½ hours.

The rise of temperature of the room air above the corridor air was from 2° to 23° F.

The percentage of the total heat of the gas burnt which was given to the air passed through the rooms, was from 0·62 to a maximum of 3·64.

The percentage lost from the top of the flue was from 0·11 to 22·98.

The effect on the relative humidity of the room air was usually to reduce it very slightly, except in the case of some of the flueless stoves,

which caused an increase of humidity. I may say that in all the tests which I have made, whether of gas, coal or coke fires, there was an *increase* in the amount of moisture in the room air under test of 1 to 2 grains per c. ft. This was usually accompanied by a *reduction* of humidity, due apparently to the rise of temperature.

CO_2 *in Room Air.*—This never rose to above 9 parts per 10,000 in any of the rooms fitted with gas stoves having flues. In two of the rooms having flueless stoves it rose to over 30 parts per 10,000.

CO *in Room Air.*—This was only detected in three cases, one being a flueless stove, another a flue stove found to be faulty.

Potassium permanganate Test.—The results of this were unsatisfactory, owing partly to the dust in the air of the building. The reduction of $KMnO_4$ was from 0·48 to 2·06 cc. of centinormal solution, after exposure for 2 hours in a 5″ diameter dish to the room air.

Musk Plant Test.—No connection could be traced between the state of the plants and the amount of impurities in the air. In fact, high temperature appeared to be the most potent cause of injury.

The number of cubic feet of gas burnt per hour per degree F. of rise of temperature of the room air above the corridor air, varied in the flue stoves from 2·46 to 27·81, the latter, however, being exceptional; in fact, with four exceptions the figure was always under 5. It was lower in the flueless stoves than in those fitted with a flue, varying from 1·30 to 4·06.

The cost in pence per hour per degree of rise of temperature F., in the room above the corridor temperature, varied, in the flue stoves, from 0·075d. to 1d., in the flueless stoves from 0·047d. to 0·146d.

A good many of the stoves produced a smell in the room, varying from "very slight" to "strong and unpleasant"; in fact, only 12 are noted as producing no smell, and one of these is a new stove similar to a stove previously tested which gave a bad smell, owing, probably, to faulty jointing of the parts of the stove.

The conclusions arrived at as a result of the inquiry are as follows:—A properly constructed gas stove, with a flue sufficiently large to carry away the products of combustion, although for constant work more costly than a coal fire, is quite as satisfactory from a hygienic point of view, and does not in any way vitiate the air of the room, nor does it produce any abnormal drying effect as is popularly supposed." Such a stove will carry off from 2,000 to 4,000 c. ft. of air per hour, which is a valuable ventilating effect.

Compared with coal fires, less heat is generated, the calorific value of the gas burnt seldom being more than one third of that of the fuel burnt in a coal grate; this is partly due to the cost of gas.

Gas fires cost something like four times as much for steady work as coal fires, that is, comparing them on the basis of the cost per degree F. of rise in temperature of the room, which was only about 0·026d. per hour for coal in the tests which I previously carried out for the Society. On the other hand a steadier temperature is maintained by the gas fires than by coal fires: there is no trouble in lighting, no waste of fuel while the fire is being lighted or let out.

Flueless gas stoves are very economical of gas, but call for plenty of ventilation in the rooms where they are installed. There is, however, the danger with these stoves that, if anything goes wrong with the flame and the combustion becomes imperfect, the poisonous products are poured out into the room. Carbon monoxide is very poisonous, 0·05 per cent. producing evil results, and 1·3 per cent. causing death if breathed for long; hence the danger of anything going wrong with the stove which may cause the evolution of CO. It was detected in the air of one room heated by a flueless stove.

It has been proved that if the flame of a bunsen burner is cooled too much by contact with cold surfaces, imperfect combustion results, and CO is produced.

The flue gases were in several instances analysed for CO in these tests, but none was found.

Improvements indicated.—It was recommended that another opening to provide an entrance for air to the flue, other than through the stove, should be provided for the purpose of ventilation, as this was found to enormously increase the draught.

Fuel.—Some improvement in the fuel used is indicated, as some of the fires did not raise their fuel to a bright red heat. Improvement should take the form of fuel with a larger exposed surface and a greater network of interstices.

Flues.—To initiate the draught and assist it, the elbow at the back and all sudden bends should be avoided, the flue should not leave the stove horizontally but inclining upwards, and the opening of the flue should be at the highest point of the canopy.

I may say, in conclusion, that all temperatures were noted at half-hourly intervals, and curves plotted for each stove. It was upon these curves that all calculations were based; the first part, when the temperature was rising, being neglected in making the calculations as to thermal efficiency, and only the latter parts of the curves utilised, when the stove or fire had settled down to its work.

GAS FIRES FROM THE HYGIENIC POINT OF VIEW.

By F. W. GOODENOUGH.

THE very full report (based upon exhaustive and scientific tests) recently issued by the Coal Smoke Abatement Society (and published in the *Lancet* for the 17th November last), proves conclusively that many of the prejudices hitherto entertained by the public against the use of gas fires in place of coal for domestic heating purposes are without foundation.

The two medical experts who carried out the investigations on behalf of the Coal Smoke Abatement Society state emphatically that their tests proved that a properly constructed gas fire, with a flue sufficiently large to carry away the products of combustion, is quite as satisfactory from a hygienic point of view as a coal fire, does not in any way vitiate the air of the room in which it is used, nor does its use result in any abnormal drying of the air of the room as is so commonly supposed. Moreover, a gas fire exerts a useful ventilating influence, as it will remove from 2,000 to 4,000 c. ft. of air per hour from the room in which it is used.

The report further points out that a gas fire has the advantage over a coal fire in that it heats a room much more rapidly and also more regularly than a coal fire; in which necessarily a large amount of fuel is wasted, both before a hot and useful fire is obtained and also after heat is no longer required, as the consumption of fuel in a coal fire cannot be brought to an instant conclusion by the turning of a tap as can that in a gas fire. The examiners therefore state that it is their opinion that from the point of view of economy gas would run coal very closely for domestic uses, where it is seldom necessary to have a fire burning for long periods. They are also of opinion that a properly constructed gas fire has the advantage of a coal fire from the hygienic point of view, owing to the more equable temperature and the absence of dust and smoke. Another point in favour of gas fires, which is mentioned in the report, is that they can be easily regulated and the heat of the room controlled in a way which is not possible with coal fires.

ADVANTAGES AND DISADVANTAGES OF HEATING BUILDINGS WITH GAS STOVES OF VARIOUS TYPES.

By SAMUEL RIDEAL, D.Sc., F.I.C.,

(FELLOW.)

Read at Sessional Meeting, London, December 12th, 1906.

IN opening a discussion on this subject, I think it is the wish of the Council that it should be confined to its hygienic aspect, and not include considerations of economy.

Most of us are agreed that gaseous fuel or gaseous heat is economical, convenient, and cleanly, and our discussion resolves itself into the advantages and disadvantages of heating buildings by gas stoves of the two types: those in which the products of combustion are admitted into the room, and those in which they are withdrawn from the room by means of a flue. It is evident that gas stoves of the latter type have many features in common with stoves burning other forms of fuel in which the products are withdrawn by means of a chimney or flue ; moreover, that the heating of buildings in this way depends entirely upon the radiant heat and the conduction through the walls and chimney-piece, and that the convection heat is lost. This is the chief disadvantage of all such forms of heating, as only a fraction of the total heat is utilised. The open grate customary in London for heating domestic rooms by coal has survived in spite of this and other faults, the most conspicuous being that the products are usually laden with black soot, smoke, and poisonous gases (sulphuretted hydrogen and carbon monoxide), which are unsuitable for discharge into a room, so that the evils of burning coal or wood in a room without a flue

were obvious even in a prescientific age, and invention has been attracted towards utilising the waste which such methods involve.

The gas stove, in which the products of combustion passed, like those from coal or wood, out of an open grate into a flue, at once modified the position, as the combustion of coal gas is more under control, the products are more completely burnt; and even in gas stoves of very early type sulphuretted hydrogen was never found, and only carbon monoxide in minute quantities. Moreover, the amount of soot or smoke produced was insignificant. Therefore the chief objections to allowing the products to escape into the room had disappeared when burners insuring complete combustion of the gas were introduced, and it seemed reasonable to suggest that the time had arrived when the advantages of a flue did not outweigh the enormous disadvantage of loss of heat.

The subject was discussed at length in 1893, when the *Lancet* appointed a special commission, which drew attention to the advantages of gaseous fuel for smoke prevention, and pointed out that from this point of view, gas, as a means of heating, was to be preferred to coal. Since that time makers of gas stoves have put on the market flueless stoves of various types, which are in common use, and these have been criticised severely by many sanitary reformers as causing injury to health from the vitiation of the atmosphere by the products of combustion.

This Institute has had the subject under consideration for some years. At the Liverpool Exhibition in 1904 the following was first included in the general regulations "that no stove in which heat is produced by combustion will be admitted without a flue being provided for carrying out the products of combustion."

In 1905, before the Smoke Abatement Exhibition, the Committee were urged to suspend this regulation, but after carefully considering the matter they decided not to do so. However, the Council in January, 1906, had before them the question of appointing a committee to report upon flueless stoves, and they recommended that I should be asked to report upon the sanitary aspects of some of the principal types of flueless gas stoves now in the market, "taking more specially into account the amount and quality of the products of combustion that escape into the room or dwelling." Accordingly I made these trials in May, 1906.

In October, 1906, the Exhibition Committee received a letter from the British Gas Industries Society sending a formal protest against the action of the Institute in not permitting stoves in which heat is produced by combustion to be admitted to the Exhibition without a flue being provided. It was decided to reply to the Society that the Committee

have no evidence that would justify them in withdrawing their regulation with reference to flueless stoves.

In the first place, therefore, it is necessary to consider what the products of combustion of a gas stove (with and without condensation) are. We have already seen that sulphuretted hydrogen has never been among these products, and from improvements in burners carbon monoxide and smoke are now no longer to be feared, and in my recent inquiry on behalf of this Council, I have satisfied myself that acetylene, another poisonous gas which was likely to be found, is also not produced in these gas stoves of the flueless type.

The products, therefore, consist of carbonic acid, aqueous vapour, and sulphur acids; roughly speaking 5 c.f. of coal gas produces about 2½ c.f. of carbonic acid, 6½ c.f. of aqueous vapour, and consumes about 5½ c.f. of oxygen. The quantity of sulphur formerly permitted in this quantity of gas was equal to one grain, but in the majority of towns, and now practically in all towns, including London, no sulphur limit obtains, and one expects to find from this quantity of coal gas two to three grains of sulphur oxidised to sulphurous or sulphuric acid.

It is evident that the water is the largest product, and if it remains in the gaseous condition a large amount of heat is conveyed by it to warm the cool walls. A condensing stove liquefying *the whole* of the water will, on the other hand, prevent the increase of the moisture of the air in the room which is desirable with the rise in temperature, and will also condense all the sulphur acids, both of which are exceedingly soluble in water, together with a small quantity of the carbonic acid, so that in a perfect condensing stove the only product introduced into the air is carbonic acid, equal to half the volume of the gas burnt. Under these ideal conditions there is an actual reduction of pressure in the atmosphere in the room, owing to the fact that the condensed water occupies practically no volume as compared to the atmospheric oxygen required to produce it. Thus with a stove consuming 10 c.f. of gas per hour and using, say, 11 c.f. of oxygen derived from 55 c.f. of air, after one hour's burning the 11 c.f. of oxygen will be replaced by 5 c.f. of carbonic acid, giving a contraction equal to about 6 c.f. in the total room space, which must be filled by an influx of a fresh supply of outside air bearing its proper proportion of oxygen, and this change will go on from hour to hour. Assuming there is no ventilation other than that produced in this way, and that all the heat is radiated or conveyed to the walls, the composition of the air in the room will approximately be as follows, taking for example a capacity of 4,000 cubic feet:—

TABLE I.

	NITROGEN. c.f.	NITROGEN. per cent.	OXYGEN. c.f.	OXYGEN. per cent.	CO_2 c.f.	Vols. per 10,000.
When stove is lighted ...	3,198	79·9	800	20·0	2	5·0
After 1 hour..................	3,204	80·1	789	19·7	7	17·5
" 2 "	3,210	80·2	778	19·5	12	30·0
" 5 "	3,228	80·7	745	18·6	27	67·5
" 6 "	3,234	80·8	734	18·4	32	80·0

If on the other hand the heat be all utilised in warming the air of the room, the 4,000 c.f. of air would be raised 9° F. for every cubic foot of gas burnt, with a corresponding increase in volume.

From the above table it will be found that the actual oxygen reductions are very small, and, roughly, equal to twice the volume of carbonic acid produced, so that if the room gains 25 c.f. of carbonic acid after 5 hours in the 4,000, equal to ·625 per cent., the quantity of oxygen in the room will have diminished from 800 volumes to 745, or only 1·4 per cent., whilst the balance is made up by a slight increase of nitrogen.

It is evident, therefore, that under such theoretical conditions the composition of the air is only slightly modified by the combustion of the gas in a flueless manner, and it is doubtful whether such variation in the quality of the air has any material influence upon health. The only change that is readily measured is the increase in the quantity of carbonic acid. There is no evidence that carbonic acid, *per se*, in these quantities is injurious to health. Although determinations of carbonic acid give an excellent indication of the ventilation of a room, the limits which have been put forward as standards have been derived from considerations of the quality of the air produced when the carbonic acid present is of respiratory origin, and not from the ideal stove which we are now considering. A man delivers less than one cubic foot of carbonic acid per hour, or say one-fifth that of the gas stove under consideration; but associated with this carbonic acid are all the other products in this case, including, as we know, the uncondensed water vapour, bacteria, traces of organic matter, and the undefined spirotoxines, which have hitherto been believed to be the real offenders in determining the unpleasantness of a badly ventilated room.

Whilst it is impossible to find in the market an ideal flueless stove of the above description, it is also equally true that it is impossible to find the ideal room so devoid of ventilation as to allow the accumulation of carbonic acid to proceed at the rate indicated. It is found that an

ordinary closed room is sufficiently permeable to allow the air to be naturally changed every two or three hours, through crevices and through the walls.

We have, therefore, to consider first of all how far modern flueless stoves fall short of the ideal indicated above, and whether the ordinary room or corridor in which such stove is to be placed is likely or unlikely to be so devoid of ventilation as to allow the products of combustion to accumulate in the space unduly. The conditions will not be uniform, and from the stoves I have examined, and ventilation data of rooms, one can say that these two features are so variable that it is difficult to predict them without examination.

In February, 1904, in an examination of condensing stoves of a particular manufacture burning ordinary gas in London, Manchester, Birmingham, Liverpool, Glasgow, Newcastle, and Bristol, I found the percentage of water condensed to average 17 per cent., and the removal of sulphur to range from 0·6 to 10·7 grains per 100 c.f. of gas burnt, with an average of 4·3 grains. At Falkirk, where water gas was used, 100 c.f. yielded 33 fl. oz. of condensed water and only 0·37 grains of sulphur.*

I have since found the following condensations in some different types of condensing stoves. One c.f. of the gas produced about 30 cc. of water, or 1 fl. oz., and contained 0·3 grains sulphur.

TABLE II.

	Hours.	c.f. gas burnt.	WATER. formed cc.	condensed cc.	per cent.	SULPHUR OXIDES as Sulphur. formed grains.	condensed grains.	per cent.
I.	3	19	564	20·8	3·7	5·7	0·2	3·5
II.	4	33	979	45	4·6	9·9	0·46	4·6
III.	4	28	831	327	39·3	8·4	2·54	30
IV.	4	32	949	143	15·1	9·6	0·94	10

It would appear, therefore, that the condensation of the sulphur acids is proportional to the amount of the water condensed. We may infer that in an ideal stove which liquefied all the water, little or no sulphur would be added to the air of the room. Increased condensation means economy of heat, but it is attended by some mechanical difficulties, one being that the gaseous products may be cooled to such an extent as to hinder convection. In cases where the heating effect is mainly due to radiation, condensation is obviously advantageous.

* For further details see Report of Departmental Committee on gas testing in the Metropolis, 1904, p. 238.

The following table shows the quantity of heat produced in the above experiments, and the amount conveyed by the uncondensed water to the walls and ceiling:—

TABLE III.

	Time in hours.	WATER in CC.'s produced.	WATER in CC.'s condensed in stove.	HEAT produced B. T. U.	WATER. deposited on walls.	WATER. per hour.	HEAT. absorbed on walls.	HEAT. per cent.
I.	3	564	20·8 cc	12350	469·9 cc	156·6 cc	333·7	8·11
II.	4	979	45	21450	803·6	200·9	428·1	7·98
III.	4	831	327	18200	334·4	83·6	178·1	3·91
IV.	4	949	143	20800	620·0	155·0	300·3	5·77

The case of carbonic acid is different; the water produced by burning coal gas is more than sufficient to dissolve all the sulphur acids, but as it only dissolves about its own volume of carbonic acid, it cannot absorb more than 1/500 per cent. of the total amount of this gas formed. Although, therefore, it is true that a portion of the CO_2 is taken up by the condensed water, it is incorrect to say that "the quantity varies but is always considerable."

Absorption of the carbonic acid by lime or a caustic alkali is not practicable. One c.f. of gas, producing 26 grammes of CO_2, requires for the absorption of the latter 36 grammes of quicklime (CaO), or 47 grammes of slaked lime. If quicklime were used it would become slaked by the absorption of water, and in this change it greatly increases in volume. A stove consuming 10 c.f. of gas per hour would require 470 grammes, or nearly a pound, of lime per hour.

Certain theoretical factors will be helpful at this stage in enabling us to predict the condition of a room in which flueless stoves only partially condensing are being used. The heated products containing a portion of the water and of the sulphur acids will ascend to the ceiling, and although not condensed in the stove will condense upon any cool surface with which they come in contact. An individual in the room is at a higher temperature, and provided he does not breathe immediately above the stove, we can assume that these two products will be condensed before he has to breathe the air. In the case of the lime-washed ceiling or the plaster wall, the basic constituents of these are sufficient to fix the sulphuric acid produced by such stove for many years. If care be taken in the construction of rooms and corridors to insure sufficient circulation of gases, and sufficient area of such basic substances, the condensation of the acid water on other materials will be small.

It is also to be recollected that the sulphuric acid cannot under any circumstances be re-volatilised into the air of the room, and even that deposited on glass or woodwork must be finally neutralised by contact with basic substances, such as soap or washing soda.

We can therefore say that a flueless stove, although imperfectly condensing, can under such conditions be ütilised, and that the only determining factor is the carbonic acid content of the room, which will be determined by the volume of the gas burnt, and the natural ventilation conditions of the room itself.

Pure carbonic acid contents of 60 volumes per 10,000 are not poisonous, and it is only when 300 volumes are reached that respiration becomes slightly deeper and more frequent.

Reductions of 5 to 6 per cent. in the oxygen content of the atmospheric air also do not seem to have any permanent injurious effects. Such an alteration in the content of oxygen is comparable with that in the amount of inhaled oxygen which may be caused by changes in the atmospheric pressure, and even if accompanied by a low barometer, the volume of oxygen per c.f. of air in such a room would still be greater than that at common mountain altitudes.

If the suitability of a room for habitation depends on the relation of the humidity to temperature, these factors are controllable by most forms of condensing stoves.

That gaseous carbonic acid cannot be regarded as an offender is well seen in the recommendation of the Departmental Committee on the Ventilation of Factories and Workshops,* where a higher limit of carbonic acid is suggested for gas-lit factories than those in which no such lights are burning. It is pointed out in that report also, "a moderate increase in carbonic acid and diminution of oxygen in the air is not in itself prejudicial to health." Since the above was written the Coal Smoke Abatement Society have published a report on 25 different makes of gas stoves (*Lancet*, Nov. 17th, 1906), in which it is concluded that "with plenty of ventilation the flueless condensing gas fires would be very suitable for warming rooms or passages." I may add that, from the considerations I have put before you, flueless gas stoves, especially those of a condensing type, are also indicated as an aid to defective ventilation.

MR. T. W. ALDWINCKLE (London) said it was very satisfactory for architects to have an opportunity of learning from such a competent authority as Dr. Rideal exactly what was the nature and extent of the products of combustion arising from gas stoves of various kinds. This would clear away a good deal of

* 1902.

prejudice which naturally existed, owing to a want of exact information on the subject. It was certainly reassuring to learn that there was no need of fear as regards carbon monoxide and sulphuretted hydrogen. There appeared, however, to be a serious omission in Dr. Rideal's paper; he seemed to leave off just at the point when one was expecting further and important information as to in what places and under what conditions he would recommend the use of gas stoves; and, indeed, recommend them as being preferable to any other method of warming. There could be no doubt that the flueless condensing gas stove filled a place which could not well be occupied by any other kind of stove. There were many positions where, except by means of heating apparatus, the flueless gas stove was the only possible one, such as in halls, passages, and staircases, where usually a flue did not exist. In these positions they must be thankful for such a stove, and must be content to put up with its disadvantages. It was most probable, however, that the flueless gas stove would be recommended for use in other positions, such as living rooms, workrooms, etc., and then it became very necessary to look closely into the hygienic conditions under which these stoves would be used. No doubt as a means of producing warmth they would always be highly efficient, as the convection heat must be proportionately large, but this was not the whole question, nor, indeed, the most important part of it. It appeared from Dr. Rideal's paper that even with a good stove of this type there would always be a certain amount of sulphur acids and a comparatively large quantity of carbonic acid produced, which would enter into the air of the apartment. As architects they had always understood that good ventilation should not allow more than 6 volumes per 10,000 of carbonic acid to be in the air of the room. He was therefore somewhat shocked to see by Dr. Rideal's figures that a gas stove produced in 6 hours 80 parts in 10,000 in a room containing 4,000 cubic feet, and to notice, a little later on that Dr. Rideal stated, should he say somewhat apologetically? that 60 volumes in 10,000 were not poisonous. Doubtless they were not, but were they consistent with health? He took it that a very large amount of effective ventilation would be necessary in such a room in order to keep it hygienic. And it was just at this point of good ventilation that the flueless stove appeared to fail. An open fireplace, or even a gas stove with a flue, not only warmed the room but acted as a powerful exhaust ventilator, and without exhaust ventilation it was impossible to secure a good supply of incoming fresh air unless mechanical means were used. This relation of warming and ventilation was as important in connection with flueless gas stoves as with any other class of fireplace; and he felt sure that there would always be serious hygienic difficulties in connection with this class of stove unless special ventilation was provided to meet the special circumstances of the case.

MR. F. W. GOODENOUGH (of the Gas Light and Coke Company) confessed that the paper was disappointing to him in some respects. The author, in his slight reference to gas fires with flues, spoke of them as affording radiant

heat only; the convection heat, he said, was lost. There were, however, few gas fires used with flues that did give a very material proportion of their heat as convection heat: especially those furnished with chambers that intercepted the products of combustion between the point where they left the so-called fuel and the exit into the chimney. He thought that with many gas fires 30 per cent. of the heat would be convected heat, as distinct from radiant heat; but whether a large proportion of convected heat was really preferable or not was, of course, another question. Dr. Rideal made use of the expression: "It seemed reasonable to suggest that the time had arrived when the advantages of a flue did not outweigh the enormous disadvantage of loss of heat"; and somewhat earlier in the paper he remarked: "Only a fraction of the total heat is utilized." Of course, nine-tenths was a fraction; but he took it the author meant only a small fraction. The tests made for the Coal Smoke Abatement Society showed that the loss of heat up a flue was not an enormous proportion of the whole. In fact, the tests were really too good to be true in this respect; for in one case it was stated that only 0·11 per cent. of the heat passed out through the flue. This sounded Utopian; but he thought the amount lost in the flue did not (with any efficient fire) exceed 25 per cent. of the total heat generated. Then, of course, the disadvantage of the loss of heat was accompanied by a corresponding advantage in the valuable ventilating effect of the draught created in the chimney by that heat. Doubtless defective ventilation had been the cause of most of the troubles that consumers had attributed to the supposed dry heat of gas fires. The author had spoken of the "increase in the moisture of the air of the room which is desirable with the rise of temperature." Well, opinions might differ as to this; for everyone knew that a dry heat was more endurable than a moist one. It was a very unfortunate thing really that the tests of the Coal Smoke Abatement Society were made just too soon, because since the gas fires were submitted to them by the different makers, other types had been put on the market which undoubtedly gave a better result than those tested. This was due to the adoption of the upright form of the so-called "fuel" or fireclay lumps, giving a free way to the flame practically until the gas was all burnt. Thus there was no possibility of carbon monoxide being given off, and the true heat-value of the gas was secured. Then the fuel was in only one layer, which obviated loss from cold air passing up the fuel at the back. The fixing of gas and air regulators to stoves was another important improvement which enabled users to adjust the flame to meet local conditions. This should do a good deal to further popularise gas fires. The other source of disappointment to him in the paper was that it did not contain as a conclusion a recommendation to the Committee of the Institute to withdraw their regulation against the exhibition of condensing stoves, to which the author referred. Certainly, the paper furnished some evidence which would justify the withdrawal, and the tests of the Coal Smoke Abatement Society afforded further evidence. The latter showed that the increases in carbonic acid were much lower than the theoretical figures given in the first table of the paper. The table stated that with a stove burning 10 c. ft.

of gas an hour the carbonic acid in a room with a capacity of 4,000 c. ft. would rise from 2 to 80 parts per 10,000 after six hours' burning; whereas one of the tests of the Coal Smoke Abatement Society, with a stove burning 14 c. ft. of gas per hour, showed an increase only from 5·3 to 8 volumes per 10,000. The increase shown in some of the tests of stoves with flues was quite as much, and was attributed by the examiners to the effect of their being in the room and exhaling carbonic acid during the test. No doubt the prejudice against gas stoves, which still existed in some minds, was disappearing; and he hoped that the paper, together with the report of the Coal Smoke Abatement Society, would assist in removing that prejudice.

PROF. BOSTOCK HILL (Birmingham) said he agreed with hardly any of the conclusions Dr. Rideal had brought forward. The subject was a very important one, because it was only by the use of gas instead of bituminous coal that they could overcome many of the more important difficulties arising in connection with the pollution of the atmosphere in towns and the mitigation of irritating fogs. The prejudice against the use of gas in fires and stoves had been no where more marked than in the minds of the medical profession, particularly the curative branch. These gentlemen continually advised patients not to put those "horrible gas stoves" in bed rooms. This prejudice was no doubt due to improper construction of gas stoves when they were first introduced, notably when these allowed the products of combustion to escape into the atmosphere of the rooms. He felt bound to say that he regarded the paper itself as a crushing indictment of the flueless stoves, upon the figures put forward by Dr. Rideal to minimise the evils consequent on the use of such stoves. Dr. Rideal assumed conditions which practically never existed. For instance, in how many rooms, not to say bed rooms, were there to be found 4,000 cubic feet? and even in this case the conditions were not satisfactory. What would be the condition, therefore, in smaller rooms, where the stoves would exercise a greater polluting influence? With regard to carbonic acid, it was true that unless there was one per cent. present in the atmosphere they did not get actual toxic qualities, but even with the considerable quantity Dr. Rideal suggested they got respiratory troubles, even without the presence of spirotoxines. There was also a diminution of oxygen as shown in Dr. Rideal's figures, which, although he called it a small one, could not be considered satisfactory. The teaching of hygiene at the present time was all for purity in air and other conditions, and it was a dangerous doctrine to preach that conditions little understood need not of necessity be injurious to health. One other point, too, was worthy of attention. Dr. Rideal admitted that real condensing stoves did not exist, and called attention to the fact that in plastered rooms the ceilings and walls contained enough basic material to combine with the sulphur acids from the gas, but what would be the condition of curtains, pictures, books, etc., when these sulphur acids settled upon them? knowing, as we did, the destructive effects of the fumes from gas

when used for the purposes of illumination. He did not think that Dr. Rideal had made out any case for the flueless gas stove in the sanitary sense, and he did not think that anything had been said which would cause the Committee of Judges to alter the conditions now ruling for the exhibition of gas heating appliances.

Mr. A. Saxon Snell (London) expressed his surprise at the statement of the author that gas was economical as a fuel; he thought the experience of most of those present was contrary to this. It was only economical when the fire was required for a short time. He also noticed that Dr. Rideal ignored the value of the open fire as a ventilator.

Dr. A. Des Vœux (London) remarked that he was connected with the gas-stove tests of the Coal Smoke Abatement Society, which were conducted primarily with a view to discovering whether gas-fires were hygienic, and secondly to investigate them from an economical standpoint. He thought the calculations in the paper with regard to flueless stoves corresponded very well with the results of the tests he referred to. The figures were a little different; but variations in the conditions of testing might easily account for this. He could not, however, agree with all the author's conclusions. Whether a flueless stove when put into a room was hurtful might be a debatable question; but he should take the side that in a room with no other ventilation than the air coming through the walls and crevices under the door, etc., it might be extremely detrimental to health. The carbonic acid produced by the stove, added to what would be produced by the people in the room, might make an amount that would be very dangerous to health. It would be wrong to recommend flueless stoves in sitting or bed rooms without very efficient ventilation. He was brought up to think that all gas-fires were dangerous, and that it was risky to allow a patient to be in a bedroom with one; but he had now come to believe in gas-fires when properly set and connected with the chimney. They were very efficient heaters; and though perhaps not so cheap as coal fires, they had many other advantages, particularly where it was desirable that a patient should not be disturbed. For the last few years, in all cases of long illness, he had always ordered a gas-fire to be put into the bedroom, and had never had any reason to regret it.

Mr. J. Osborne Smith, (London), said he had frequently been asked to put a flueless stove into a class-room accommodating thirty children, to supplement an open fire at the other end of the room, but had consistently refused, for the reason that he did not believe in putting into such a room, to generate heat, anything which would have the effect of making the air more or less impure. He had always substituted hot-water coils. A very large gas stove was required as the equivalent of a coal fire, and to guard against down-draughts in the flues, gas stoves are often fixed in fireplaces in such a manner as

to considerably reduce the effective means of ventilating the rooms. The gas companies find the introduction of improved gas stoves pays; still, we owe them a debt of gratitude for what they have done in that direction during the last ten years. The electric light stirred them up, and he was hoping that by and by there would be a gas stove which the architectural profession could use elsewhere than in passages.

Dr. J. S. OWENS (London) referring to the question of carbonic acid, said that there was this danger, that on account of the carbonic acid displacing the oxygen, it caused an increase in the number of respirations per minute, and so an increased rapidity in the absorption of other poisons. About 3 per cent. of carbon dioxide was required in the air to produce a noticeable increase in the rapidity of respiration. With regard to condensing stoves (with the recent tests of which for the Coal Smoke Abatement Society he was connected), there was one important point, that carbon monoxide might be given off when any little thing went wrong. If they could be certain that carbonic acid would be the only impurity present, it would be all right; but they could not be sure of this with flueless stoves. As to the percentage of heat passing out with the flue gases in the tests referred to, he thought there was a slight misunderstanding, because the figure given in the results was the percentage loss out of the top of the flue. Much, therefore, depended on the length of the flue· with the shorter flues, there would be a higher percentage of loss. In previous tests made for the Society, the flues were 68 feet high; and roughly there was a loss of 15 per cent. with the flue gases. In recent tests with similar fires, the flues were 53 feet high; and the loss ran up to 21 and 22 per cent. These were both with coal fires. The gas fire tests were mostly conducted with flues about 68 feet long; but in one case, in which the flue was 23 feet, the loss was most remarkable, about 50 per cent. The presumption was that the actual amount of heat passing into the flue at the bottom was very high; it was a different thing from the amount passing out of the flue at the top. This was where some mistakes had arisen. It had been said that the arrangement of fuel had been altered since the tests were carried out; but he might say that the fuel was placed very carefully, so that the apertures in the lumps were well over the burners, and it was well separated from the burners to prevent impinging of the flame on a cold surface too soon. Some were single, and some double rows of fuel. As to the carbonic acid in the rooms heated by condensing stoves, as compared with the theoretical figure, the rooms were not hermetically sealed, and, as stated in the report, the floors were of coke breeze concrete, which allowed of the passage of air. One of the tables included in the report showed that the cost of gas for heating, at 3s. per 1,000 c. ft., was from two to four times as much as that of the best coal fires. He was strongly of opinion that in every other respect gas fires, with good flues and thorough ventilation, were better than, or certainly as good as, coal fires.

Mr. Arthur J. Martin (London) said that what he and other users of gas stoves wanted to know was whether the objections to flueless stoves were based on mere *a priori* considerations, or whether there was positive evidence of injury to health from well designed stoves of this type. If men could stand CO_2 up to something like 500 parts in 10,000, it hardly seemed likely that a gas stove would ever in practice give off such an amount as to produce any injurious effects. There was, of course, a danger when there were products of incomplete combustion, such as carbon monoxide; but he would like to ask Dr. Rideal whether these products were not confined to stoves of a certain type, in which the flames were allowed to come into contact with so-called fuel at a much lower temperature. The proportions of CO_2 mentioned on page 77 of his paper seemed to have given rise to a great deal of unnecessary alarm. Dr. Rideal had expressly stated that these proportions could only be attained in the absence of ventilation, whereas it was well known that there was always a considerable interchange between the internal and external air. One practical consideration which seemed to have been overlooked was that before the CO_2 could increase to the extent indicated the room would have become unbearably hot. It was, therefore, absurd to treat this as a ground for objecting to flueless stoves. Dr. Rideal's room capacity of 4,000 c. ft. had been referred to as unusually large. He (Mr. Martin) had worked out some figures for a room of 2,500 c. ft., containing five men, and heated by a flueless stove burning 10 c. ft. of gas per hour.

At 1 c. ft. of CO_2 per head the five men would produce	5 c. ft.
The 10 c. ft. of gas would also yield	5 c. ft.
Together	10 c. ft.

If all the heat from the gas were imparted to the air of the room, and the latter were changed twice per hour, the temperature of the 5,000 c. ft. of air so admitted would be raised by 72°, and the 10 c. ft. of CO_2 would represent 20 parts in 10,000. If 7,500 c. ft. of air were sent through the room, renewing its contents every 20 minutes, the rise in temperature would be 48°, and 13·3 parts of CO_2 would be added to each 10,000 c. ft. In practice the rise in temperature would be somewhat reduced by loss of heat through the walls. A great deal of stress had been laid on the importance of safeguarding the purity of the air, and it seemed to be taken for granted that this could be best effected by providing the stove with a flue. Were they justified in making this assumption? He wished it to be clearly understood that in asking these questions he did not mean to convey any views of his own on the point in question. They were suggested by a report of some German experiments on lighting which appeared in the last volume of the Proceedings of the Institution of Civil Engineers. Observations were made on rooms lighted with gas and with electricity. "In occupied rooms (with the crudest ventilation, such as openings near the ceiling) the carbonic acid was found to be actually less for gas at the end of the experi-

ment, which is attributed to the increased circulation due to the higher temperature." The influence of gas fires upon ventilation seemed to deserve fuller investigation than it had yet received.

DR. W. H. HURSLEY (London) remarked in reference to the amount of carbon dioxide in air that could be inhaled without ill effects, that in some experiments he had made with the object of comparing Pettenkofer's and Haldane's method of determining carbon dioxide when present in large amount in air, he had himself felt no ill effects beyond the inconvenience of a high temperature when the carbon dioxide in an unventilated room had been raised to 58 volumes in 10,000 by means of powerful non-luminous gas burners.

MR. W. H. T. WEBBER (London) said that flueless gas heating stoves could be made innocuous from a reasonable hygienic point of view, as Dr. Rideal had shown. Some previous speakers appeared to have taken Dr. Rideal's theoretical analysis of the effects of using gas stoves of this class in a closed space, as a representation of facts likely to occur in experience, which nullified much of their criticism. Really, in the work-a-day world, there was a large use for such stoves in cold, draughty passages, and shops with open doors, where the ventilation was excessive and no other source of warmth was available. For the sake of shop assistants and others having to remain long hours in such situations, he pleaded that wholesale condemnation should not be passed by the medical profession upon the flueless gas heating stove, which, he admitted, was not suited to all interiors.

DR. RIDEAL (London), in reply, said that the paper had exceeded his expectations. He brought it forward in a way which he thought would provoke a good discussion; and it had done so. The paper had not satisfied either those interested in gas stoves or the medical profession. There was, therefore, good ground for believing that it represented a fair opinion on the subject. His own views had, however, been omitted. The only general opinion he had ventured to express was the one at the end of the paper, that flueless stoves, especially those of the condensing type, might be looked upon as an aid to defective ventilation; and he had not heard anything, either from the advocates of gas or from medical men, to cause him to alter this opinion.

COAL SMOKE ABATEMENT IN ENGLAND.*

By Dr. LOUIS ASCHER (Königsberg, Prussia).

MY interest in coal smoke abatement in England was aroused by reading a report in the *Times* (of December, 1905) of a conference arranged by the Coal Smoke Abatement Society in conjunction with The Royal Sanitary Institute.

It was after finishing a work on coal smoke nuisances that I read this report. This research, begun for another purpose, showed me an effect of coal smoke hitherto unknown. Allow me briefly to point out this effect.

When I began my investigations concerning mortality from tuberculosis among coal miners, I was surprised to find how low this was, both in Prussia and in England. But I found that the mortality from acute lung diseases, not tuberculosis, was very high. The death-rate from acute lung diseases of Prussia and of some other industrial countries, e.g., America and England is increasing, especially among young children and old people; in the latter country, however, this increasing death-rate falls after the year 1895. In districts where the amount of coal smoke was greatest, there was the highest mortality from acute lung diseases. It appeared that the age of death from tuberculosis is continually decreasing in Prussia, and is lowest in those districts where the amount of coal smoke is greatest. I therefore formed the deduction that smoke must tend to produce acute pulmonary diseases, and that it hastens the course of tuberculosis. Other hypotheses were rejected.

The experiments necessary were made on animals:—

1. (*a*) Rabbits were made to inhale coal smoke and were then infected (by inhalation) with *Aspergillus fumigatus*.
   (*b*) Other rabbits infected with *A. fumigatus* without coal smoke.
   - (*a*) Contracted acute pulmonary disease.
   - (*b*) Did not contract acute pulmonary disease.

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* Paper read before the Committee of the Coal Smoke Abatement Society in London.

2. (a) Rabbits were infected with tuberculosis and inhaled coal smoke.
(b) Rabbits were infected with tuberculosis and did not inhale coal smoke.
(a) Died after 53 days on the average.
(b) Died after 90 days on the average.

This last result has been confirmed by the valuable experiments conducted by Bartel and Neumann, under the direction of Weichselbaum, at Vienna.

In table 18, page ciii., of the 66th annual report of the Registrar-General, there is seen to be a progression of mortality from pneumonia and bronchitis from 2977·4 (in 1866–1870) to 3225·6 (in 1891–1895). But from that time the mortality from these diseases sinks considerably, and it would be a valuable work to examine whether there is already to be seen any result from coal smoke abatement.

Mr. Chubb has inquired (p. 134 of the report about the conference on smoke abatement) from 145 councils if coal smoke has decreased in their areas, and received the reply that it has in 80 cases.

Dr. James Niven, Medical Officer of Health of Manchester, the well-known statistician, has kindly given me the statistics which appear below:

City of Manchester.

	Fog-days	All ages death-rate per 1,000 of the population from acute lung diseases.	Death-rate under 1 year per 1,000 births from acute lung diseases.
1896–1900	36·8	5·04	33·53
1901–1905	23·4	4·28	31·10

From these statistics we see that the number of fog days has decreased, and we find a corresponding decrease in mortality from acute pulmonary diseases, especially in children under one year. This decrease may, perhaps, be due to coal smoke abatement, which in Manchester is classical.

During the last few years, however, we find death from acute lung diseases in urban registration counties in still higher proportion to deaths in rural registration counties. Compare the following statistics:

Urban Registration Counties.			*Rural Registration Counties.*		
Glamorgan	27	(1903–04)	Buckingham ..	16	(1902–04)
Lancaster	29	(1902–04)	Cambridge	19	„
London	24	„	Cornwall	20	„
Middlesex	19	„	Hereford	18	„
Monmouth	27	„	Huntingdon ..	16	„
Northumberland	25	„	Lincoln	19	„
Nottingham ..	27	„	North Wales ..	—	„
Stafford	25	„	Norfolk	19	„
Warwick	23	„	Oxford	17	„
East Riding....	24	„	Rutland	22	„
West Riding ..	20	„	Somersetshire ..	17	„
			Suffolk.......	16	„
Average	26·5		Westmorland ..	11	„
			Wilts	17	„
				17·5	

But we must not forget, in reading these statistics, that smoke is only one factor in causing acute pulmonary diseases. There are other factors, e.g., climate, infectious germs, especially the influenza bacillus. Conditions of life, e.g., bad dwellings, starvation, etc., are to be considered.

Among labourers we find that the death-rate from acute lung diseases is much higher where the workers are employed in a smoky atmosphere, than where they are employed in fresh air. The following statistics are taken from the 55th annual report of the Registrar-General. Men between 15 and 65 died of acute lung diseases:—

Occupied males in agricultural districts	18·6	per 1000 living.
Coal miners	32·6	„
Coal heavers	65·6	„
Chimney sweeps and soot merchants ..	43·1	„

This great difference is to be seen among young labourers before alcoholism and other factors could operate, as we see in the following statistics taken from the same report:—

Years	*15–20*	*20–25*	*25–35*	*35–45*	*45–55*	*55–65*	*65 & upwards*
Occupied Males	2·1	5·2	8·4	16·7	32·4	65·9	239·5
Coal Miners ..	5·2	10·3	15·9	29·4	87·4	239·6	548·3

Considering the many points, chemical, technical, economical, and legal (not to mention medical), involved in coal smoke abatement, we see that it is a complicated task. But it is a very important task because it

is the most essential factor in purifying the air of large towns, so necessary for modern life.

In England I have found four points to be considered with regard to coal smoke abatement:—

1. Analysis of the atmosphere: (*a*) meteorological, (*b*) chemical;
2. Legal data, which permit of taking notice of the local circumstances: (*a*) general laws, (*b*) special by-laws;
3. Appointment of special well provided inspectors, mostly under the direction of medical officers;
4. Chemical and technical improvements in firing.

As to the first point: the great quantity of water in the air of England produces black fogs, caused by the smoke. To the two Russells we owe thorough investigations, but we have not reached the end of the subject. Fogs in general are caused and made denser by the presence of soot in the air. Public attention was drawn to this, therefore, first in England.

Chemical analysis of the air is of great importance. Manchester possesses a model method for air analysis; and it is a pity that this method is so often neglected. Clockwork gasometers are used which suck in air, and this air is analysed. This method, I believe we owe to Prof. T. B. Cohen, who has left Manchester for Leeds. Mr. Rowe, the chemical inspector of smoke for Manchester, told me that this apparatus was placed in different parts of the town, so that it was possible to get a very good notion of the chemical quality of Manchester air. By putting up such an apparatus near suspected chimneys, it was possible to prove that the chimney caused the air near it to be bad, and to show to what degree the air was contaminated. Glasgow made its analysis by another method, invented by, I believe, Angus Smith, as Sir John Ure Primrose explained at the London meeting. In different parts of the town vessels were put up to collect rain and snow. Glasgow air has been improved by the Alkali Act and by smoke abatement. I believe that it is best to combine both methods, as is done in Manchester, so that the one method may be checked by the other. Perhaps these methods could be made complete by the analysis of large quantities of air, collected, at a certain height over the roofs, by mechanical ventilators. In speaking of smoke abatement the necessity of analysis of the air must again be emphasized. For there can be no reason why we should analyse water, which we take only in small quantities, and not air, which we continually inhale in much larger quantities.

With regard to legal data, we see from the "Reports on the laws in force in certain foreign countries in regard to the emission of smoke from

chimneys (presented to both Houses of Parliament by Command of His Majesty, February, 1905)" that English legislation began to forward the work of smoke abatement before foreign. But the by-laws of the different towns are still more valuable, because they prescribe an exact time-limit for the emission of black and grey smoke. A report has been issued by Professor Harvey Littlejohn, formerly of Sheffield, in March, 1897, from which we can see the maximum allowances in English towns.

But all laws are ineffective without officers to inform the police about offenders, and to show the offenders how to meet the case at once. I have seen all these arrangements in perfection in Manchester. We need trained men for this work, such as are employed in Liverpool and Manchester. It is of great importance to find a good method of showing objectively the density and duration of smoke; subjective evidence is likely to be wrong. We have as yet no exact methods. All the methods in use have faults.

But all arrangements are concerned only with the smoke from factories. For the smoke from houses there is no method, no law, and no officer. Yet this smoke is the more dangerous because it is emitted so much lower and enters our open windows.

We come now to the fourth point. The technical improvement of heating apparatus in houses is the only means of dealing with smoke from houses. This must be done, too, in factories. Thanks to the kindness of many employers I have seen many ingenious appliances for smoke prevention in use, but these are either insufficient or not economical enough to justify compulsory adoption. Nearly all depend too much upon the attention of a well-trained stoker.

Only a gaseous fuel which admits of perfect combustion can satisfy hygienic demands. I have already seen several gas stoves in use; but these are too expensive for general use. Gas will become cheaper when the by-products can be used without waste. In Dudleyport I saw how Mond gas was prepared in a plant which provided gas for power and heating over an extent of several miles. The by-products from Mond gas fetch a high price; it seems that such a gas will soon have a great future. It can be used both in houses and in mills, so that the problem of domestic firing also can be solved.

The great iron and steel works now spoil their environs by a wasteful expulsion of gases. These gases could be collected in a system of pipes for use, so that there would be a gain in economy, health, and cleanliness. I saw the beginning of this enterprise at several great modern blast-furnaces in the neighbourhood of Newcastle-on-Tyne. These gases were used, however, by the factories only.

All employers, whether owners of little or of great factories, told me that coal smoke abatement means enforcement of economy of coal.

This last discovery was for me very valuable, for I am not an engineer. I was astonished to find that my ideals for coal smoke abatement had in some cases been long realised. These ideals were analysis of the air, methods for observation of the smoke, laws, and inspectors.

It is a pity that these improvements have not been mentioned in technical or hygienic papers, so that the continent has remained in ignorance of them. A report in the *Times* (1905) first showed me how much it was possible to learn in England.

It is possible further to improve, and all persons interested in coal smoke abatement should meet at certain periods to discuss the question, and to encourage people to struggle against this most prevalent source of contamination of the air.

NOTES ON RECENT LITERATURE ON PLAGUE.

IN the Journal of the Institute (Vol. XXVI., No. 11, 1905) a note on the recent literature on plague was given, summarising the work that had been done on the subject.

Since that time the epidemiology of this disease has been further investigated, and the knowledge obtained from the researches which have been made is so valuable and far-reaching that it is well again to consider them, as they lead us to hope that in the light thrown on the subject by recent experiments and the increased knowledge obtained from them, we may be able to formulate such preventive measures as will finally stamp out this disease. There is still some divergence of opinion on the subject; but a careful perusal of the literature and the value of each observer's investigations leave no doubt of the care and precautions each has adopted to arrive at the true solution of a difficult problem, and of the real value each series of experiments contributes to our knowledge of the diffusion and spread of plague.

In the supplement to the Thirty-fourth Annual Report of the Local Government Board (1904–05) is given an interesting series of experiments in a report on the transmission of plague in the rat, by Dr. Klein, F.R.S. In the introduction to this report Dr. Klein gives a summary of the present position, and appears to take exception to those observers who regard the chief method of transmission of plague as likely to be parallel with that observed in regard of diseases like malaria and yellow fever.

The conclusions which Dr. Klein draws from the results he obtained from laboratory experiments are that "there is a distinct failure of evidence that transmission of the disease is effected by fleas from an infected animal to a healthy one." It is not, therefore, in his view justifiable to regard this mode of transmission as anything but exceptional, at any rate as far as the sewer rats are concerned. Theoretically, such a transmission is possible and easily imaginable; it is possible that a flea which has just sucked from the rat blood well charged with *B. pestis* may by biting a neighbouring rat directly inoculate it. "But what I wish to insist on is that such an occurrence is not likely under natural conditions to be anything but exceptional; there is no direct evidence that this has happened, and in cases where it might have been expected to happen, *e.g.*, in many experiments recorded by me, it certainly did not do so."

In direct contradiction of the above statements, which are made solely on the results of laboratory experiments, we have the valuable and exhaustive report published by the Advisatory Committee appointed by the

Secretary of State for India (*Journal of Hygiene*, Vol. VI., No. 4, 1906). On behalf of the Advisatory Committee a working committee has carried on investigations in India. The work of the Indian committee has been done in Bombay City and in two isolated villages in the Punjab, particular attention being given to the epizootic spread of plague among rats, to the precise relationship of the epizootic to the epidemic, and to the modes by which the disease may be communicated by rats to man.

Plague can exist and spread under a great variety of climatic conditions, but when once it becomes epidemic it exhibits a marked seasonal prevalence. In the great majority of instances the outbreak of plague among men is known to be associated with and generally to have been preceded by an epizootic among rats. Such is the case in India and such, too, occurred in South Africa, and it is the strong belief of those who have seen epidemics that a causal relationship exists and that the epizootic is the most important factor of the epidemic spread of the disease.

The experiments made by the Indian Committee show that the rat flea (*P. cheopis*) of India feeds on man, and is capable of infecting healthy animals when plague is present.

The rat flea in Europe differs from the species in India and elsewhere, inasmuch as it does not readily transfer itself to man and does not feed on him. Numerous experiments have been made, all of which show how readily plague may be conveyed by fleas. Caged animals were placed in plague houses in pairs, completely protected from soil and contact infection, and equally exposed to aerial infection. One of each pair was protected from fleas, but the others were not protected. None of the protected animals contracted plague, several of the infected ones died from it; and among the fleas arrested and caught by the protective apparatus a certain proportion were found to contain, in their digestive track, large numbers of bacilli identical with plague bacilli. Experiments also showed that grossly infected floors ceased to convey infection to rats and guinea-pigs after the lapse of twenty-four hours, and that the blood of infected rats contains an enormous number of plague bacilli.

The plague bacilli suffered from no diminution of virulence in passing through the bodies of several successive rats; the virus does not appear to have become attenuated in any degree. Another important point is that the existence of what is described as "chronic plague" has been demonstrated in rats caught in previously infected localities during periods when the disease was quiescent. This fact appears to indicate that plague in an unsuspected form may linger in the rat population and may again become virulent among them under conditions of unknown causes.

A careful study of these experiments and of the work of the Commission suggests that plague is a disease from which rats suffer, and that the flea is the ordinary agent of its communication to man. The experimental work has been carried out with every care, and the facts recorded in this most interesting report should lead to such preventive measures being adopted as will put an end to the ravages of this terrible disease.

J. L. N.

NOTES ON LEGISLATION AND LAW CASES.

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ADULTERATION.—"*Prejudice of the Purchaser*"—*Rum diluted with water—Sale of Food and Drugs Act, 1875 (38 & 39 Vict. c. 63), s. 6—Sale of Food and Drugs Act Amendment Act, 1879 (42 & 43 Vict. c. 30), s. 6.*

A notice exhibited by an innkeeper that "All spirits sold in this establishment . . . . in order to comply with the Food and Drugs Act, will not be of any guaranteed strength" is not sufficient to bring to the mind of the purchaser the fact that the spirits sold are diluted to a strength below the standard provided by s. 6 of Sale of Food and Drugs Act Amendment Act, 1879. Therefore, where rum is sold by the innkeeper consisting of 93·3 parts of rum of 25 degrees under proof as mentioned in s. 6 of the Act of 1879 and 3·7 parts of added water, the notice is not sufficient to protect the innkeeper from conviction under s. 7 of the Sale of Food and Drugs Act, 1875, for selling rum to the prejudice of the purchaser.

So held by Lord Alverstone C.J. and Ridley J. (Darling J. dissenting). (Nov., 1906.)

DAWES v. WILKINSON. Div. Ct., 1 K.B., 278 (1907).

LONDON.—*Water—Supply of water by meter—"Premises"—Land used for building operations—Waterworks Clauses Act, 1847 (10 & 11 Vict. c. 17), s. 43—East London Waterworks Act, 1853 (16 & 17 Vict. c. clxvi.), s. 79).*

The word "premises" in s. 79 of the East London Waterworks Act, 1853, does not include land upon which the owner and occupier proposes to conduct building operations. Therefore the East London Waterworks Company are not liable to conviction under s. 43 of the Waterworks Clauses Act, 1847, and s. 79 of the Act of 1853, for neglecting to afford to the owner or occupier of the land a supply of water by meter for purposes other than the purposes in respect of which water rates are, by the Act of 1853, provided or limited. (Nov., 1906.)

METROPOLITAN WATER BOARD v. PAYNE. Div. Ct., 1 K.B., 285 (1907).

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DISCUSSION ON THE QUESTION

TO WHAT EXTENT MUST AUTHORITIES PURIFY SEWAGE?

Opened by GEORGE REID, M.D., D.P.H.,
(FELLOW,)

At Sessional Meeting, Stafford, 16th February, 1907.

UNTIL lately those who have devoted special attention to the question of sewage disposal have, so far as the result to be achieved is concerned, been more or less of one mind. It is true that unsuccessful attempts have been made from time to time to arrive at a fixed standard of purity for effluents, but while these attempts, for reasons which need not now be considered, have failed, hitherto it has been generally accepted that the sole object in sewage treatment is the production of a stable non-putrescent effluent by what may be called legitimate means, namely the removal, disintegration, and subsequent oxidation of the organic matter.

Accepting this for the moment as the sum total of our responsibility, while it cannot be said that we have arrived at finality as regards methods, we may undoubtedly claim to have advanced sufficiently far to justify confidence in recommending specific schemes. One is not surprised to find, however, that the authorities who have to provide the money are still somewhat inclined to view our proposals with incredulity born of previous costly failures. At the same time, the numerous successes already achieved are having the effect of gradually breaking down this want of faith, the sceptics are diminishing in number, and in recommending schemes for acceptance past failures are now less frequently advanced as reasons for further delay in carrying out improved works. Only those

of us who have been actively engaged in the work during the past 15 years or so are aware of the difficulties which have had to be overcome; and if, after all, it should turn out that we have been raising false hopes in assuring authorities that the limit of our requirements had been reached, our position will not be an enviable one. Should certain proposals, which have recently been advanced, gain acceptance, and we are called upon to sterilise sewage effluents, that will be the unfortunate position in which we shall find ourselves. Still this must not deter us from bringing further pressure to bear on the unhappy ratepayer if the proposal should prove to be justifiable.

To elicit discussion on that proposition is the object of this paper.

Although the question of sterilising sewage effluents has been the subject of more or less shadowy talk among public health experts for some time past, it is somewhat remarkable, seeing that the need for such a proceeding can only be justified on medical grounds, that the proposal is being pushed forward by engineering experts, while those medical experts, or the majority of them, who, up to the present, have publicly expressed their views, contend that the suggestion is impracticable and cannot be justified from a public health point of view.

The most recent scheme (the first, I believe, which has been seriously advanced as being practicable and not prohibitive on the ground of cost) was brought forward last autumn in a paper read at the Society of Engineers, under the joint authorship of two of its members, Messrs. W. Pollard Digby and H. C. H. Shenton. Through the kind invitation of the Council of the Society, I had the privilege of being present at the meeting when this paper was read, and it surprised me very much to find that the majority of the members who took part in the discussion appeared to agree with the authors both as to the need for sterilising effluents and the practicableness of the method proposed.

For the purpose of to-day's discussion, let us agree that pathogenic organisms survive the process of sewage treatment by modern methods, and thus may endanger health by contaminating sources of water supply, shell-fish layings, watercress beds, etc. It follows, then, that the public must, as far as possible, be protected against this risk, and the question is, does the proposal of Messrs. Digby and Shenton meet the case, is it practicable, and can we reasonably call upon authorities to adopt it?

Shortly, the proposal is this: having carried the process of sewage treatment up to the point we have hitherto deemed sufficient, before discharging the effluent from the works it is to be rendered sterile by the

addition of an adequate amount of sodium hypochlorite, electrolytically produced. It is suggested that the plant to be provided shall be capable of dealing with three times the dry weather flow, and it is estimated that the cost involved will amount to 11s. per million gallons, on the basis of 1d. per unit for electrical power and 1d. per 10 lbs. of salt.

Now admitting that the plant is capable of accomplishing what is claimed for it, we have to consider whether the end justifies the means, and the best way of arriving at an answer to that question is by hypothetically applying the process in a concrete case.

Take, for example, the water supply for a town of 10,000 inhabitants obtained from a stream which higher up receives the effluent from the sewage works of a town with a population of 50,000 where the sewers carry all the storm water.

Taking the volume of sewage per head at 20 gallons, the daily cost of sterilising the dry weather flow would amount to 11s., a figure which would frequently be exceeded during rainy periods. It is difficult to estimate how often, and for how long, the volume to be treated would reach the maximum of three times the dry weather flow, as districts vary so much in that respect, but, taking an average of twelve hours a fortnight, the cost of treatment would amount to about £220 per annum, that is if electrical power at the low cost of 1d. per unit is available; what the cost would be if a special plant had to be provided for generating the electricity I leave you to judge.

Now it may be said that this is not a very large sum to pay if any material security from the point of view of the water supply is to result from it. But would this be so, even allowing that no breakdown in the plant occurs from time to time, and that efficient supervision is always maintained? What, for example, becomes of storm water in excess of three times the dry weather flow? The authors of the paper admit that the process is only financially feasible in the absence of organic matter in suspension and of any material amount of organic matter in solution in the effluent; therefore it is a finishing process to be applied to an effluent of high chemical purity.

The authors, in answering this question, put to them by myself at the meeting, said that the sewage by the time it had reached that stage of dilution would not be very polluting; but is that so? My experience, based upon some thousands of analyses, most certainly does not confirm this, and is it not generally admitted that for some time after the onset of heavy rain the discharge from storm overflows is highly polluting? in fact, more so than the dry weather flow as regards organic

matter in suspension. What then is to happen at such times if the water authority is to be allowed to relax any of the usual precautions in the case of river supplies by reason of the new responsibility it is suggested should be imposed on the sewage authority, and if the water authority is not allowed to relax such precautions where is the gain?

It is suggested that the cost of the process should be apportioned between the sewage authority and the water authority. Well, as far as it goes, there is some satisfaction in that, but why should the former be charged anything? If the people below select to drink the sewage of the people above, surely they should be held responsible for the cost of manipulating it to their fancy.

Again, having regard to the relative populations in the hypothetical case taken as an example (50,000 above and 10,000 below) if sterilisation is to be adopted, would it not be cheaper and more effective to apply the process at the intake of the river water, where the volume to be dealt with would be practically constant and only amount to one-fifth the dry weather sewage flow of the town above? In any case, I maintain that the safety of the public demands that the water authority shall be held solely responsible for the purity of the water they supply, and that the imposition of responsibility on an outside authority would introduce a dangerous element of false security.

Now with regard to shell-fish layings and watercress beds. In view of the limitations of the remedy proposed and its more than doubtful efficiency at certain times, are we justified in accepting it as a solution of the existing dangerous condition of things? Would any health officer be prepared to sanction the consumption of oysters from layings in close proximity to sewage outfalls upon the strength of the sewage being treated in the manner suggested? I think the answer will unhesitatingly be No. Personally I maintain that the only remedy is the removal of the beds to a position of safety. I am aware that this is only applicable to proprietary layings, and that the danger from shell-fish collected from foreshores by salesmen, or gathered by the public, would still exist. These dangerous points, however, could very well be ascertained, and notice boards might be put up cautioning the public of the risk they run in eating shell-fish from such areas. The notices would, of course, be frequently disregarded, but would not less injury thus result than if the public, on the strength of the adoption of highly fallible precautions, were encouraged to gather shell-fish from unsafe areas? Exactly the same remarks apply in the case of watercress beds.

In considering how best to introduce this question for discussion, I

had an uncomfortable feeling throughout that I was wasting my time and would overtax your indulgence by going into detail regarding a proposal which I maintain stands condemned on general principles. Sooner or later the public will realise that sewage, no matter what artificial precautions may be adopted to render it harmless so far as specific disease is concerned, should not form a constituent of our water supplies, and I suggest that we are setting back the hands of the clock by searching for palliative remedies when common decency dictates the adoption of more radical measures.

PROF. BOSTOCK HILL (Warwickshire C.C.) said the question whether it was necessary to fix a bacterial standard had been touched upon. Standards hitherto had been purely chemical; they might be either chemical or bacterial, and he believed that all who had had a lengthy experience of sewage purification had now come to the conclusion that on a large scale anything approaching a chemical standard was an impossibility, and it was beginning to be felt that the question of standard must be one of locality. What was a suitable standard in one town might be unsuitable for another. If a rough standard were required, he believed, as the result of long experience, that there was no better standard than fish life. If a stream were sufficiently oxygenated fish would carry on a healthy existence in it, and that was the only definite, practical, and regular standard which, from an economical point of view, could be agreed to as common to all localities. As to the suggestion that it was desirable or necessary to sterilise sewage, he thought that by any such proceeding the very foundations of modern sanitation were upset. It seemed to him that by sterilising their sewage they were endeavouring to render suitable an unfit water supply. If there was one principle which should actuate sanitarians, it was the principle of cleanliness and purity as applied to water, and to allow a company or a community to supply water which might, perhaps, be productive of specific disease, was unworthy of the sanitary age in which they lived. Instead of endeavouring to raise false standards of security by going to the expense of sterilisation when the principle was wholly wrong, it was their duty to remove from the list of possible watersheds all those streams which received a large quantity of sewage. Speaking as a medical officer of health he was absolutely opposed to the suggestion of supplying in the place of water a dilute solution of chemicals.

MR. H. C. H. SHENTON (London), joint author of a paper read recently before the Society of Engineers, sent the following note, which was read:—

There were several points in the paper which Dr. Reid appeared to have mis-

understood. Dr. Reid stated that it had been suggested that plant should be provided capable of dealing with three times the dry-weather flow. What was suggested was that a flow of twenty gallons a head was the amount of sewage which would come from a perfectly designed system needing purification. This was, of course, rather an ideal than an exact statement of what was likely to exist at most places for some time to come yet, and therefore the authors had said that if necessary three times the dry-weather flow could be treated. As a matter of fact any number of times the dry-weather flow could be sterilised in any particular place, but speaking generally, it was fairly apparent that in the district referred to (the Thames valley above the waterworks' intakes), the flow of sewage, taken as a whole, ought not to exceed 60 gallons a head. If Dr. Reid would refer to the paper he would see that the remarks referred to had a special application. Dr. Reid had asked a question as to storm-water, to which a hurried reply had been given that it was possible to treat and sterilise sewage up to three times the daily dry-weather flow. This was a slip; the reply should have been that it was possible to treat six volumes according to the ordinary requirements of the Local Government Board Where the flow of sewage from an ordinary town was increased every now and then up to several times its ordinary volume, it argued either that the storm-water or subsoil water found its way into the sewers; both of which could, and should, be excluded in a new system. There was no reason to assume that the washings from roofs, or even from paved roads, contained pathogenic germs any more than did the drainage from the fields in the river valley. What was obviously required was to exclude the certain bacterial pollution which must occur where ordinary domestic sewage was discharged untreated into rivers from which drinking water was drawn. He agreed with what Dr. Reid said as to the possibility of storm-water from foul sewers polluting the river, however great the dilution. There were two possibilities: to treat the storm water with the sewage and sterilise it; to exclude the storm water entirely from the sewers and to purify or sterilise the sewage only. In neither case could it be said that the cost of sterilisation was very excessive, and he wished to point out that he and Mr. Digby had never suggested that the cost of sterilisation should fall upon local authorities. The water authorities, whose intake existed on the river below the point of discharge for sewage, should pay for sterilising, and anything in the nature of sand filtration. Thus, to assume a case of a village situated in the Lee valley, and discharging its effluent into the river above the intakes of the Metropolitan Water Board, it would be fair to make the local authority discharge an effluent which was chemically pure, that is to say, up to the ordinary standard of the Lee Conservancy Board below the waterworks' intakes, and to make the Metropolitan Water Board pay for the sterilisation or further treatment in order to remove discolouration, etc. Dr. Reid had said, "Why should the sewage disposal authority be charged anything?" He agreed with Dr. Reid on that point. Dr. Reid was taking up a very bold position in condemning the

sterilisation of sewage effluent upon general principles, seeing that it must be obvious that however objectionable it might be, and whatever steps were taken to remedy the defect, London must of necessity for many years to come continue to drink water originally polluted with sewage. If Dr. Reid thought that six millions of people in London should continue to drink water known to be so polluted when it reached the Water Company's intakes until such time as the Metropolitan Water Board could construct the necessary works to procure a supply from Wales or elsewhere, and until they could induce the London ratepayer to pay for it, he was surely taking up a strange position. Surely in the case of London every practicable means should be adopted to prevent the possibility of disease germs finding their way, not only into the London water mains, but into the rivers from which those mains drew their supply.

MR. SIDNEY R. LOWCOCK (London and Birmingham) said that he agreed with Dr. Reid and Dr. Bostock Hill that sterilisation in this connection was impracticable, and a mistake. The system of sterilisation was no new thing, over fifty years ago it was tried at Leicester and other places and failed, then it cropped up again some fifteen or sixteen years ago in what was known as the Bacillite process at Kettering, King's Norton, etc., and again proved an utter failure. They knew perfectly well that the object in the purification of sewage and organic matters was not sterilisation, but conversion into their inorganic elements. No known practical process would remove the bacteria, but he did not think that it had ever been shown that this was desirable as a general proposition; pathogenic bacteria ought, of course, to be destroyed, but as Dr. Hill had pointed out the proper place to do this, and the only place where it could be done, was before the sewage containing such bacteria was ever allowed to pass into the sewers at all. As a water as well as a sewerage engineer, he considered that as a general principle no sewage effluent ought to be allowed to find its way into a stream from which water supply was obtained, but they could not shut their eyes to facts, and it was well known that in many cases this state of things did exist, notably in the case of the Thames valley, without any bad effect, so far as it was possible to judge by the health statistics of the area supplied. Taking the case of London, which is the reverse of the hypothetical case given by Dr. Reid, the population above the intakes of the Metropolitan Water Board is roughly one million, and assuming that the sewage effluents from the whole of this population at twenty gallons per head per day reaches the river (which it does not), the total quantity would be 20,000,000 gallons per day, or less than one-seventh of the daily quantity of water taken from the river by the Water Board. Even if it were practicable or desirable to adopt any such treatment as that suggested by Messrs. Shenton & Digby, it would obviously be far easier and cheaper to deal with the smaller quantity at the effluent outfalls than the larger quantity at the Water Board intakes. As to which authority should be held responsible and be called

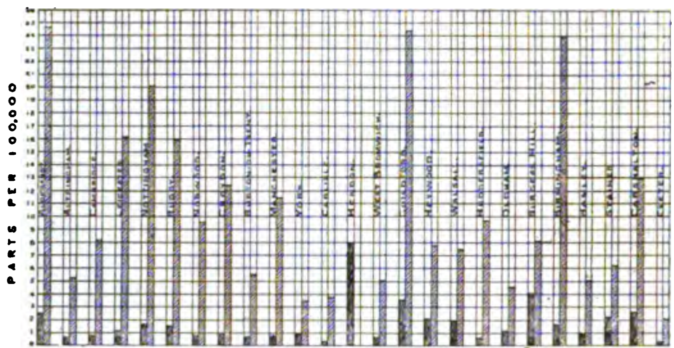
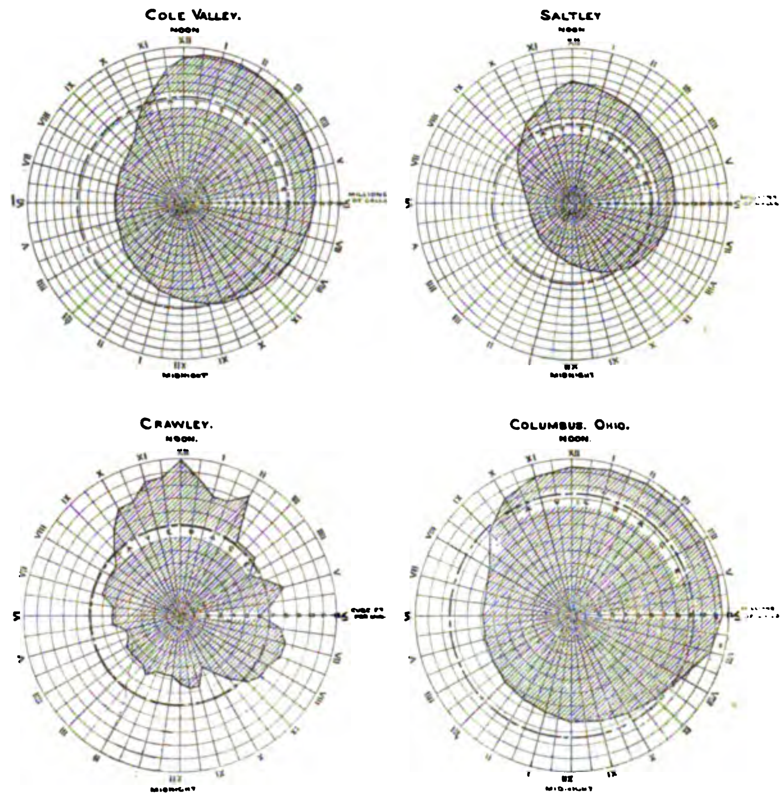
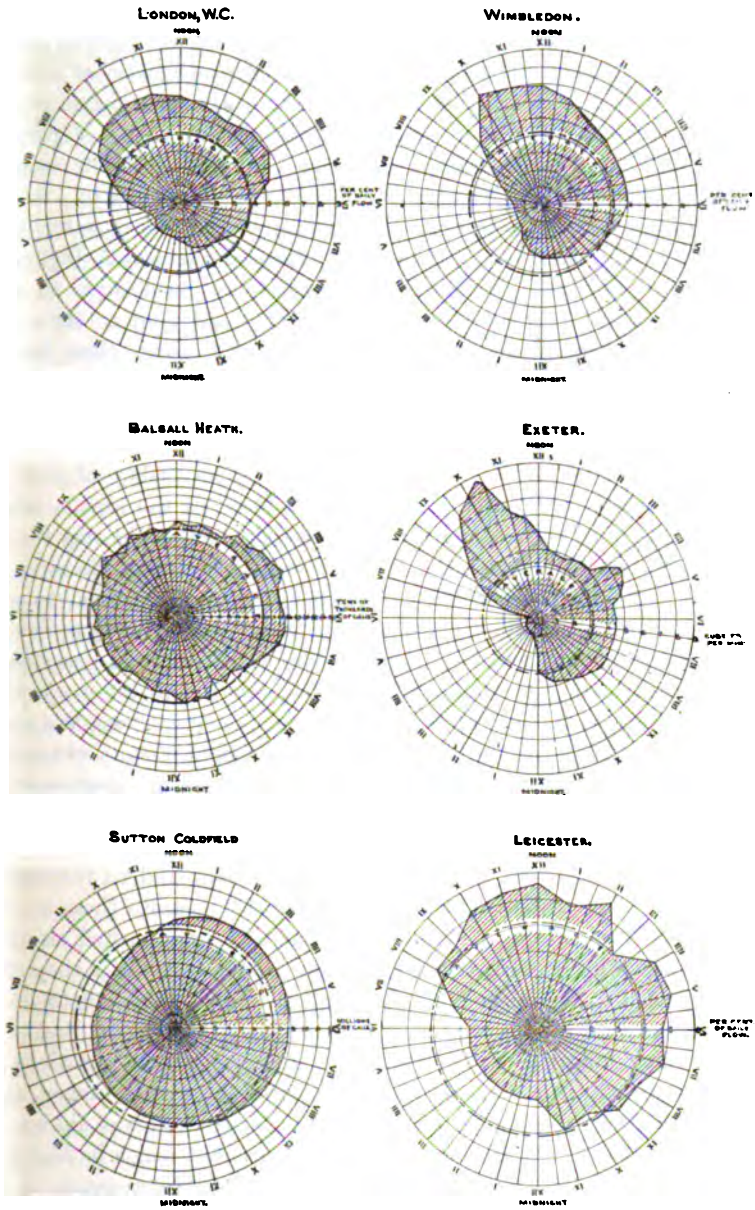


DIAGRAM SHOWING ALBUMENOID AMMONIA AND OXYGEN CONSUMED IN 4 HRS. AT 80°F BY CRUDE SEWAGES.

ALBUMENOID AMMONIA SHOWN ▬ OXYGEN CONSUMED SHOWN ▬



Rate of flow in Sewers during 24 hours.



Rate of flow in Sewers during 24 hours.

upon to pay for such treatment it must depend entirely on the circumstances of the case. If a water authority elects, or could obtain powers, to take water from a stream into which sewage effluents are discharged above the water intake, the water authority ought to be responsible and pay for all treatment necessary to render pure the water distributed by it; but if, on the other hand, any sewage authority discharges an effluent into a stream already used for purposes of water supply, the sewage authority should be held absolutely responsible, and pay for all necessary treatment of the effluent so turned in. Any treatment of sewage must also deal with the whole of the storm water, and not only up to three volumes as suggested by Messrs. Shenton & Digby, for he thought they would all agree that dilution was not purification at all, even supposing it existed; but all the information they had went to show that the sewage during storm water periods was frequently worse than during ordinary dry weather flow, while at the same time the river water contained much less dissolved oxygen, with the consequence that it was not so capable of dealing with the sewage. In endeavouring to answer the question asked by Dr. Reid in the title of his paper, Mr. Lowcock thought the quality of any effluent must be considered in connection with the condition of the stream into which the effluent was to be turned, and speaking generally he thought that the effluent should be non-putrescible, and should produce no bad effect whatever on the stream. If such conditions could be obtained, the result, carried to a logical conclusion, would be that the rivers would be in at least as good a condition as if no sewage effluents ever reached them. Although it was not germane to the paper, as Dr. Reid in his opening remarks had referred to the works they had seen that morning at Hanley, he thought he might refer to them, and congratulate Dr. Reid and the engineers on the very excellent results obtained. He attributed this success to the fact that they had started by experimenting, and when they had obtained the necessary data had constructed the works on the lines indicated by the experiments. He wished, however, to utter a word of warning to the members of the Institute, to engineers, and to the authorities employing them, not to be led away and assume that because these works were successful with the sewage of Hanley that similar works erected elsewhere to deal with some other sewage would also be successful, because if they did they were foredoomed to failure and disappointment. What they had to do was to deal with the various conditions and sewages as they found them, find a proper line of working for each, and continue on that line. The variations in the composition, strength, and degrees of refractoriness of various sewages, and even of the same sewage at different periods, were enormous, as was shown on the diagram giving albuminoid ammonia and oxygen absorbed which he had prepared from returns made by the various authorities to the Royal Commission on Sewage Disposal. Not only did the various sewages vary thus in quality, but also in quantity and rate of flow at different periods of the day, as was shown in the set of clock diagrams he had prepared, some from his own observations and some

obtained from other sources. These all showed dry weather flows. Those of the Saltley (Birmingham), Cole Valley, and Sutton Coldfield sewers were from continuous diagram records kindly given him by Mr. J. D. Watson, M.Inst.C.E., engineer to the Tame and Rea Drainage Board. From these two sets of diagrams it was obvious that no one system or type of works could successfully deal with such varying conditions, qualities, and quantities. He did not propose to discuss the question of the size of the filtering material, on which Dr. Reid had very strong views, and other authorities equally decided views in opposition; he personally had quite an open mind on the matter, as there was not enough information available with reference to it. The material at Hanley was very satisfactory, but it was not universally available, and they had to consider not only the size and quality, but the important question of distribution, the uniformity or otherwise of which, the rate of flow, and the periods of rest and the amount of aeration had a very great deal to do with the success or failure of the filters.

DR. S. BARWISE (Derbyshire C.C.) sent the following note, which was read:—

From a brief glance at Dr. Reid's paper he had come to the conclusion that he was needlessly alarmed. He thought that they might all rest perfectly assured that no matter what recommendation any Royal Commission made, the House of Commons would never pass a Bill compelling local authorities to purify their sewage to such an extent that it might be used for drinking water. Most of them were agreed that it was impracticable for a standard of purity for all rivers throughout the length and breadth of the land to be fixed by any Act of Parliament, although there was a great deal to be said for a central authority, such as the Local Government Board, specifying standards which should be used as general guides. So far from sharing Dr. Reid's fears, his own apprehensions were that a standard, fixed by a central authority, would be of too lax a character. In his own county he had a river the entire water of which, in the summer time, was diverted into a canal, so that the only water in the stream was the effluent from a town with a population of some 30,000 people. On the other hand, there was the river Trent, whose polluted waters brought down effluents and partially purified sewage from Staffordshire and other counties. It would be ridiculous for them to insist upon authorities in this watershed purifying their sewage to the same extent that was necessary in the case he had alluded to, or in the case of, say, Buxton, a health resort, the effluent from whose sewage disposal works was turned into a narrow valley which was a favourite walk of visitors to that town. The people of Buxton recognize that they must obtain an effluent of an exceptionally high standard of purity, and they have done it. What the County Council informed the local authorities of Derbyshire was that their effluents should contain less than 0·10 parts of albuminoid ammonia per 100,000; more than 0·5 parts of nitrogen as nitrates per 100,000; that the effluent should be so thoroughly oxydised that

it did not show any putrescibility on being submitted to the incubator test. They also told them that the frothing of an effluent after being vigorously shaken for half a minute should disappear in three seconds, and that the effluent should be so transparent that pearl type could be read through a column ten inches in depth. But no matter what standard was adopted, there could be no doubt that if any case went into Court, the Judge would take into consideration not the theoretical amount of purity which it might be possible to obtain, but the degree of purification necessary, bearing in mind that the effluent had to be turned into some particular river. This lead up to a point which Dr. Reid had referred to, namely, that river water was used for drinking purposes; that oysters were exposed to tidal river water; and river water may infect watercress-beds. He (Dr. Barwise) was in agreement with him that the only safe line (in the interests of the public at large) was for the responsibility to be put on the person or persons using the water, whether it be a Water Company distributing it for drinking purposes, the owners of a watercress-bed, or of an oyster bed. If the responsibility rested upon the local authority, these people naturally would go to little expense in doing work which they knew to be necessary for the protection of the public, feeling all the time that if anything went wrong they would be able to put the responsibility on somebody else. Again, even if it were desirable to sterilise water, this could be done much more easily when the water contained no suspended matter than when it did. It would be infinitely cheaper to sterilise the water taken in from the river before it was filtered than to sterilise the whole of the effluents from sewage works. When they came to such large towns as Birmingham, the whole scheme of sterilising the sewage was so obviously impossible on days when there was anything like an inch of rain, that it was not worth while to take up the time to discuss it. He agreed with Dr. Reid that the remedy for the oyster layings and watercress-beds being in polluted waters was for the owners to remove their beds to positions where this food, which was for human beings, was not subject to being fouled with sewage. He thought that not many medical officers of health could be found who would be prepared to eat oysters fouled with sewage which had been electrically treated. Personally he would decline. All might go on well for a certain time, and then something would go wrong with the electrolytic action, and the sterilisation would suddenly cease. With regard to the suggestions which his County Council had made as to the amount of albuminoid ammonia, nitrates, and so on, which should be contained in a sewage effluent, he found that there are many authorities who have works which produce better effluents than the standard suggests; but in mentioning the figures, it was not a fixed standard but a provisional one up to which they expected all the authorities to improve their effluents. When all the authorities had worked up to that standard it might be that they would require something more. This led him to another reason why a standard should only be adopted as a general guide; in the future new methods of analysis may be devised,

and better processes of purification brought out, so that any standard of purity must be revised from time to time. During the last few months he had been attempting to use the electro-conductivity of sewage as a means of measuring the purification effected, and with the help of Dr. Dawson Turner of Edinburgh, he had been able to ascertain that, taking the same quantity of sewage and effluent, the conductivity decreases with the purity effected. It was well known that absolutely pure water was one of the worst conductors of electricity in nature. With his apparatus Dr. Dawson Turner found that the relative conductivity was somewhat as follows: Urine, 250 ohms; crude sewage of Chesterfield, 4,500; final filtrate of Chesterfield, 6,000; while the final filtrate at Buxton had a resistance of 11,300. The subject was new, and he cordially invited all interested to join in working it up. The advantage of the method was that when it was known what degree of purity the various resistances at any particular sewage disposal works were equivalent to, all it would be necessary for the man in charge to do would be to read off his resistance and enter it up into a book as often as he was told. It would enable a local authority to know exactly what was taking place at their sewage disposal works. Conversely from the experiments he made, he had thought it was very likely that a plan could be devised for estimating the purity by using the effluent as an excitant of any ordinary voltaic battery. The more highly oxydised the effluent was, the more rapidly it would attack the negative pole. He found that by using copper and zinc electrodes with the Chesterfield sewage, he got a current with a voltage of ·21, a tank effluent of ·32, and a final filtrate of ·38. Here again he brought this matter forward in the hope that it would start experimental work on new lines. He would like to refer to one point in conclusion, and it was this: that if under any exceptional circumstances, such as where a sewage outlet is close to the intake of a Water Company, some special means should be taken with the effluent to render it more pure than would otherwise be necessary, what appeared to be the proper thing to do was that the effluent should be passed through a sand filter like an ordinary water filter. Personally he felt much more confidence in that than the killing of the organisms by electricity or ozone, or any of the latest suggested methods of killing bacteria in water.

MR. J. D. WATSON (Tame and Rea District Drainage Board) said that Dr. Reid's paper was an excellent one, and one with the conclusions of which he thought they must all agree. As Dr. Bostock Hill had said, it was false security to suppose for one minute that it was possible to obtain a safe water from a stream into which had been discharged large quantities of sewage. A great deal had been said about the standard of purity. To his mind the only feasible standard was that all sewage effluents must be non-putrescent, and must continue to improve when they reached the stream itself. The standard which had been adopted by some of our friends in the North of England might be

found to be of some service, but to apply that standard to all cases would not only be misleading but unfair, as an effluent containing more than 1 grain per gallon of oxygen absorbed was not necessarily a bad effluent; indeed, it might, under certain conditions, be an exceedingly good one. He thought that this side of the question was very well illustrated by a paper read before the Institute at the last Glasgow Congress by Professor Dunbar, of Hamburg. Dr. Dunbar showed effluents containing 2·19 grains per gallon and 6·80 grains per gallon that were non-putrescent; on the other hand, he showed a putrescent effluent which on analysis measured only ·63 grains per gallon of oxygen absorbed. Professor Percy Frankland recently read a paper on the purification of the Oldbury sewage, in which he showed non-putrescent effluents containing 7·82, 9·16, and 18·44 parts per 100,000 of oxygen absorbed. Not only were these effluents non-putrescent, but they supported fish life (gold fish). These last figures were accounted for to a very large extent by the undue proportion of sulphocyanides in the sewage. Two years ago, he (the speaker) constructed a small sewage purification installation at Great Barr for the Birmingham Hospital Saturday Committee. The sewage was domestic, but so strong that primary and secondary percolation were required to obtain the necessary purification: and his chemist (Mr. O'Shaughnessy) told him that non-putrescent effluents had been obtained which on analysis measured 9·51 parts per 100,000 of oxygen absorbed. It was not necessary to add anything further to prove that the standard adopted by the Mersey and Irwell Joint Committee and others was unsuitable as a general standard. On the subject of storm water, which was most important, they might deal with a dry weather flow, but it was rather a different thing when they had to contend with storm water. The Local Government Board had stated that they must deal with three times the dry weather flow efficiently and effectively, that three times more must be treated partially, and that any quantity above six times the dry weather flow could be discharged without treatment of any kind into a stream. But the Public Health Act said that they were not to discharge any sewage at all into a stream. It seemed to him that the Board had been rather better advised by their experts than the framers of the statutes. In regard to sterilisation at Saltley, which was only a part of the Birmingham drainage area, they had had as much as 300,000,000 gallons at one time, and the question arose, what could be done with that amount of water? It was absurd to think that they could sterilise it. If a community was to be saddled with the cost of treating such enormous volumes in times of storm, it would have something to say on the matter. The question raised by Dr. Reid was a very far-reaching one, and they ought to deal with it from a broad point of view. He was inclined to think that there should be a drainage area on each watershed, and that every town along the banks of a stream should bear its share of the cost of its purification. That would be a big work, and would require such a Board as that recommended by the Royal Commission on Sewage Disposal, or a joint

committee of county councils and others, through whose districts the river flowed, should be appointed to see that each polluting district did its duty, and to control the incidence of taxation; but whatever the form legislation were to take, a more equable method of rating and administration of the law was much required. It was necessary to do something in order to bring about a more equitable arrangement than they had at present.

MR. WILLIAM POLLARD DIGBY (London), who was unable to be present, sent the following notes, which were read:—

A perusal of Dr. Reid's paper impels me to consider myself as one on trial for heretical opinions, who feels that a sentence, perhaps hostile, may be pronounced in one's absence.

It seems, however, that Dr. Reid asks a question, and does not specifically answer it. Instead, he preaches a specious policy of *laissez faire.* This is distinctly disappointing. Sterilisation of sewage effluents may be considered under the main question of its desirability. The view that it is desirable is really not my discovery, nor is it Mr. Shenton's. We merely voiced a tendency to be found in Royal Commission reports.

Dr. Reid's retort upon us is that of the hypothetical application of the process in a concrete case. But a strained sense of proportion characterises this case. We have an instance of a town of 10,000 inhabitants receiving a water-supply from a stream contaminated with the effluent of 50,000 inhabitants. Where does such a case exist? And where is the engineer who would design water-works under such circumstances? The problems which exist are those similar to that alluded to towards the end of our paper, where, referring to London conditions, we point out that 22,000,000 gallons of sewage effluent enter the Thames, that 125,600,000 gallons are withdrawn for drinking purposes, and that the quantity so abstracted is less than 16 per cent. of the normal flow.

Dr. Reid in advancing the figure of 11 shillings per million gallons sterilised, is dealing with an effluent which would require one part of available chlorine per 300,000 to sterilize it. This would imply that the sewage contained so much organic matter as not to be acceptable to an authority like the Thames Conservancy. It is scarcely fair controversy to use figures pertaining to the extreme cases of effluents chemically impure as applying to the concrete case advanced.

I do not know where the author has any justification for stating that we have admitted "that the process is only financially feasible in the absence of organic matter in suspension, and any material amount of organic matter in solution in the effluent." Effluents from septic tanks can be easily and economically sterilised with hypochlorite solutions.

Storm-water, also, is not the bugbear announced. I can assure Dr. Reid, from my experience of over two years at Maidenhead, that during that time no storm water entering the sewers passed unsterilised from the works.

The normal working hours of the electroliser were seven or eight. No reserve plant was installed, but a reserve of solution equal to two days' normal demand was available. In times of heavy rain, the electroliser was merely worked a longer time. Dr. Reid asks, "why should the sewage authority be charged anything? If the people below select to drink the sewage of the people of above, surely they should be held responsible for the cost of manipulating it to their fancy." Pursuing that parallel, it might be asserverated that if people chose to live upon the banks of rivers containing mud banks of filth, and if they find it offensive to their nostrils, "they should pay the cost of manipulating it to their fancy." But would not this be a very sad reversal to the primitive habits of cave dwellers, and where the common weal has no existence?

Lastly, Dr. Reid asks a question. But has he answered it? Should not the answer define the proportions of organic impurities per million, and the number of pathogenic bacilli per c.c. for effluents discharged under various conditions? If the public health officers will enunciate to what extent local authorities must purify sewage, the engineers can define the costs. Their allocation is a matter for reference to an impartial tribunal, before which the local public health officers can appear as witnesses, but scarcely as witnesses and judges in the same breath.

Dr. G. J. Fowler (Manchester) observed that they had not yet solved the difficulty of storm water with regard to ordinary chemical purity, quite apart from the bacteriological question which had been raised. The difficulty was that no constant relation existed between the volume and composition of storm water. He did not see how it was possible by sterilisation to avoid pollution until they abolished storm overflows. Large impounding tanks would also be necessary, the whole thing being a problem for the engineers. He agreed that, after all, the proper place to sterilise was not at the sewage works, but at the waterworks, if done at all. To begin with, it was becoming more and more recognised that there were periods of the year during which, and conditions under which, even waterworks filters were not altogether to be relied upon. As it appeared occasionally desirable to sterilise at the waterworks, he suggested the use of ozone, which he believed would before long be a practicable method of dealing with water in such cases as might exist where an absolutely pure source was not to be found. The further advantage of sterilisation by ozone was that it added nothing to the water. But he thought it would be agreed that the remedy, whenever possible, was to get a pure source of water supply in the first instance. In conclusion, the speaker emphasised what Mr. Lowcock had said as to Hanley not being taken absolutely as a model for other works. They had very successful works there, but he was doubtful whether all sewages could be treated as they were there on fine material—at any rate, as a first step after tank treatment.

DR. REID, replying, said he was glad to find that provincial engineering opinion seemed to be entirely opposed to the metropolitan or London opinion. His sole object for bringing forward the subject at all was the extreme unanimity with which the paper of Messrs. Digby and Shenton was received by the Society of Engineers. There was not a single engineer present at the meeting at which it was read who did not congratulate the readers on the proposition brought forward, and he did not think that anyone, except himself, commented adversely upon it. There were that day among them, he believed, twenty-seven engineers and five medical officers; but notwithstanding that fact, he had not heard a single adverse comment with regard to his criticism of the paper read in London. The only adverse criticism was that of Messrs. Digby and Shenton themselves. He was sorry they were absent, but was glad that they had written dealing with his paper, of which they had had advance copies. Mr. Shenton said that in his paper he did not recommend the sterilisation of three times the dry-weather flow. He (Dr. Reid) had taken the precaution of bringing the paper, and this was what was said: "In the authors' opinion, it is perfectly practicable to purify and sterilise all the dry-weather daily flow of sewage entering the Thames, and if necessary, three times the dry-weather flow." It was admitted that storm-water polluted, and certain remedies were suggested, one being to exclude it from the sewers. But how were London and other great towns to be re-sewered? The question was asked whether London should continue to drink sewage until some other supply was obtained. Well, he was afraid it must. There was no other alternative. The sooner the people of London decided that they would no longer drink it the better. Dr. Bostock Hill had stated that a standard must depend upon local circumstances, and that was why he (Dr. Reid) had not thought that it was possible to fix a general standard. In Staffordshire the size of the streams was small compared with the volume of sewage they had to receive, and the standard for a town on the banks of the Severn in Worcestershire would not serve for one in Staffordshire. He was glad to hear that Mr. Lowcock did not treat the matter seriously, and he hoped that if the question again came before the Society of Engineers he would be able to be present. He agreed with Mr. Watson's definition of an effluent, and he did not think that anyone could be expected to do more than he suggested in treating sewage.

DR. S. RIDEAL (London), who was unable to be present, sent the following notes:—

He has read with considerable interest the notes by Dr. Reid upon the subject under discussion, and regrets that he does not consider that the time is opportune for advocating a perfect sterilisation of all polluting matters, which must be the hygienic ideal which we are all aiming at. He points out, rightly, that the cost for dealing with sewages at the present time by a sterilising

process is high, and he wishes us to come to the conclusion that this cost is not justifiable. It is unnecessary to assume, as Dr. Reid has done, that the future town, with properly designed drains, will have a storm-flow so high as at present attains in most towns.

The Local Government Board's present requirement, of full treatment of three times the dry-weather flow, assumes that storm-water and rain will frequently cause a large amount of crude sewage waters to be brought to the outfall works requiring treatment. Dr. Reid suggests that an average of twelve hours a fortnight might represent the time when this maximum of three times the dry-weather flow is reached. He gives, however, no data, showing that this is a fair average, and from the writer's experience he is satisfied that in most modern works these figures are very largely in excess of what actually attains in practice. He seems to have forgotten that in all fresh works laid down with the Local Government Board's approval, an estimate in the increase of the population is always taken as a basis of calculation for such new works, and that therefore at the moment of opening these new works, and for some years afterwards, they are designed for a volume of sewage much greater than will reach them. It follows therefore that three times the dry weather flow, for which they are designed, will not reach the average of twelve hours once a fortnight, which Dr. Reid estimates as a theoretical number which would be obtained when the works are working at the full population for which they are designed.

The suggestion that the big town is situated above the small town on our English rivers is somewhat beside the argument. In the Thames we have towns of 20,000 to 40,000 inhabitants discharging into a river which supplies three millions with water.

On the River Lee the sterilisation of the Hertford sewage is now attempted by the Water Board, and paid for by the London ratepayer.

Another point which the writer also takes exception to, is that it is possible to so design the sewers in a new town that no surface water or rain water shall reach such sewers, and as he is aware in suggested systems, such as the Liernur, a crude sewage without any rain water or surface water is treated, and consequently he is a firm believer in urging on sewage engineers the desirability of constructing watertight sewers, which not only keep out the surface water, which we all agree is important, but should be so connected with the house drains that rain water from the roofs of houses and gullies should not reach such sewerage system. We should then have practically a constant flow whatever the meteorological conditions are, and thus minimise the cost of the sterilising agent required, and reduce the complexity of working.

Dr. Reid has also not taken into account the fact that in many cases the bacterial purification prior to sterilisation need not be pushed to the same extent as it is at present advocated. This is especially the case in towns on estuaries and large rivers, as, provided the suspended matter is reduced to a minimum, there is sufficient dissolved oxygen in such streams to complete the

oxidation effect, which is at present brought about by the secondary sprinklers, or final beds. By thus doing away with the cost of such secondary beds, the additional cost of the sterilising process need not be so high as pointed out by Dr. Reid.

In many cases sea-water is available as a raw material for electrolysis, an then the whole of the salt costs are eliminated.

It may be urged that a complete separate system, such as the writer is now advocating, would still leave untreated in time of rain the large amount of storm water, which is more or less polluted. This is true; but the pollution is not of human origin, and can therefore hardly be regarded as so potentially dangerous as that of crude sewage. It must also be borne in mind that the amount of horse traffic in towns is largely diminishing, and we are reaching a time when animals of all sorts will gradually be reduced to an insignificant minimum in the ideal hygienic town we are discussing, and that consequently the filthy character of the street pavements will be much better than it has been in the past. No one can have failed to observe that, even in London, at the present time, since the advent of the motor bus, the street pavements have greatly improved in this respect.

In this connection the use of a steriliser in water-carts for dust laying is to be recommended, and Dr. Alexander's interesting practical work at Poplar indicates the direction in which the problem can be solved.

The writer takes this opportunity of referring to his remarks at the Manchester Congress, when Major Firth advocated a sterilisation of effluents. He then pointed out that a sterilisation at Manchester of six times the dry-weather flow in order to protect a stray cow from drinking a polluted supply was obviously ridiculous. He does not think that anyone would suggest the sterilisation of a sewage effluent unless the potential danger arising was serious; but so long as river waters are used for potable purposes, and so long as it is necessary for water-cress and oyster industries to exist in the proximity of inhabited districts, the desirability of adopting some such method is indicated.

For hospital and asylum work a septic tank effluent can be sterilised by 15 gallons per 1,000 of a 2 per cent. solution of available chlorine, and this liquid can be used for sewage farming or passed on to sprinklers without aerial nuisance and with perfect safety.

Phelps and Carpenter, at the Massachusetts Institute of Technology, have discussed this particular problem (Technology Quarterly, Massachusetts Inst., 1906), and in it quote Rudolf Hering's short hygienic dictum, "Nothing to be discharged into a stream without purification; nothing to be taken from a stream without purification," which seems to be the proper position for The Royal Sanitary Institute to adopt.

Dr. Reid recently remarked that the writer was guilty of a hygienic heresy in not insisting on a very low carbonic acid content in gas-heated and gas-lit rooms; he is inclined to give a *tu quoque*, and urge that the discharge of an

unsterilised pathogenic effluent into a river is a more heinous offence against the laws of sanitation.

E. George Mawbey (Leicester), who was unable to be present, sent the following note:—

On the whole, I agree with Dr. Reid's conclusions. To generally adopt methods of completely sterilising sewage effluents, does not appear to be financially practicable or theoretically advisable. It should rest upon the water authorities to obtain a pure water supply, although sewage authorities should be required to turn out an effluent, which is practically non-putrescent, free from suspended matter and harmless to fish life.

It should be borne in mind that complete sterilisation *hinders* destruction of organic matter, and our present knowledge is insufficient, perhaps, to warrant it Further, do we not require evidence that the introduction of those chemicals employed to sterilise would not injuriously affect fish life?

From the point of view of a water supply, the discharge of storm-waters, beyond the volume that can be treated, may frequently be a greater source of danger than the effluents from the ordinary dry-weather flow.

The degree of purification required should vary according to the condition and streams of any particular locality, and whether inland or by the sea, and the local limit might be fixed by an authorised board of experts.

Mr. Herbert T. Scoble (Westminster) writes as follows:—

I am very largely in accord with Dr. Reid's conclusions. To safeguard our water supplies, shell-fish layings, and watercress beds, it is all-important to exclude "specific pollution," and sterilisation of three or even six times the dry-weather flow cannot accomplish this result.

I endorse Dr. Reid's statement that the water authority should be held responsible.

The tendency now-a-days is to insist on the establishment of expensive and, no doubt, necessary works for the purification of sewage, but no adequate control exists over the management of such undertakings. I submit that it is essential that some provision should be made for the continual supervision of all sewage disposal works, as the danger of pollution will be lessened in proportion to their efficiency. In any case, however, the risk attached to the drawing of water supplies from contaminated rivers is so great that no purveying body can afford to disregard it.

THE BACTERIAL TREATMENT OF SEWAGE,

with special reference to the Biolysis of Organic Nitrogen.

By W. D. SCOTT-MONCRIEFF.
(FELLOW.)

Read at Sessional Meeting, London, March 2nd, 1907.

THE term Biolysis* is here employed to express the breaking down of organic matter used as food into inorganic substances, and the entire process may be divided into successive stages: 1st, the changes which occur in the alimentary canal; 2nd, those which are due to putrefactive fermentation; and, 3rd, the results obtained from the action of nitrifying organisms in filters specially designed for the purpose of utilising their functions.

The first stage must be almost exclusively confined to the action of anærobic organisms, and has not yet been fully investigated. It is associated with the effects obtained from the ferments of highly differentiated organs, each contributing to the work of changing the food into substances that are capable of being assimilated for supporting the life of the individual, and the waste products of these digestive processes are the materials which are finally broken down to mineral forms by the action of the second and third stages referred to.

In general terms it is true that ultimate purification in a sanitary sense can be obtained from either of the last two stages, but in Nature the second stage generally precedes the third, and makes the subsequent action of the aerobic organisms much more rapid and complete. "The steps or stages in the entire process may be repeated either in their whole

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* I first suggested the word "Biolysis" in 1893, and remember Prof. Sims Woodhead agreeing with me that it was a more comprehensive term than Bacteriolysis, which was then coming into use.

The best term I know of for expressing the second stage was made to me by Büchner at Munich in 1893. The whole process as applied to the treatment of sewage was then new to him, and when I explained my cultivation tank he called the work done "ungeschlossen," or unlocking.

sequence or in parts of it, but the essential character of the completed cycle is that the organic matter contained in the sewage should be delivered to the organisms of nitrification, freed, as far as possible, from the presence of the organisms employed in the earlier stages, and also from their enzymes or products." *

The process should be zonal in its action, each stage representing a different kind of nutriment, with which the different kinds of organisms should be in a favourable position to deal.

I made one of the early attempts to utilise and control the putrefactive

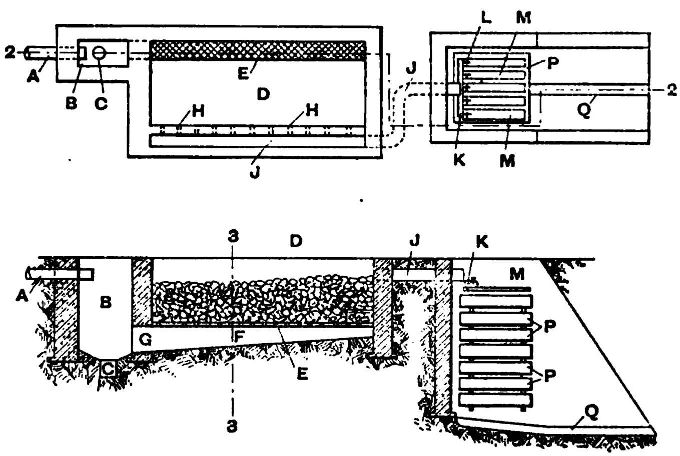

Fig 1.

A, *Sewage inlet;* **B, C,** *Grit Chamber and Sump;* **D,** *Cultivation tank;* **E,** *Grating;* **F, G,** *Underspace or restricting chamber;* **H,** *Outlets to channel;* **J, K, L,** *Valves;* **M, N,** *Tippers;* **P,** *Nitrifying Trap;* **Q,** *Exit.*

fermentation in sewage at Ashtead in 1892, and this I named a "cultivation tank." It dealt with the discharge from a household of about ten persons. In this apparatus there was a recognition of the importance of making the process zonal in its action. The sewage was first brought into what was called a "restricting chamber," which consisted of a channel

* Dr. Rideal, in "Sewage and Sewage Purification," summarises the changes without reference to the first stage, which may be spoken of as producing the sewage. He takes the initial stage as being made up of "transient aërobic changes," rapidly passing to the first stage of anaërobic liquefaction and preparation by hydrolysis. This initial stage I have frequently referred to in my earlier writings. It is represented by the chemical equivalents of the absorption and disappearance of the dissolved oxygen in the water supply, which is discharged into the sewers and drains, and in no way can be part of any artificial process except it be artificial aeration before anaërobic hydrolysis in tanks or upward filters. In the three stages I have also omitted Dr. Rideal's second stage of "semi-anaërobic breaking down of the intermediate dissolved bodies," because this is not recognised as requiring any provision beyond that of a well aerated filter, and it is covered by and included in the diagrams of what goes on in the trays and in the testing apparatus. In a chemical treatise, Dr. Rideal's division is fully justified, but the division I have adopted seems sufficient from a practical standpoint.

9 inches wide and 6 inches deep in its cross section, provided with an open grating as a cover, upon which was superimposed a bed of large flints about 14 inches deep. The tank containing the materials for this upward bacterial filter was only $2\frac{1}{2}$ ft. wide and 10 ft. long. The bottom was sloped from the edges of the grating to the sides of the tank, and the object of the design was to provide an even and continuous movement of the sewage without leaving any part of the liquid unmoved in the general direction of the flow. An arrangement by which the restricting chamber was placed on one side and sloped upwards is shown in Fig. 1.

The long intervals (one or two months) which elapsed without the necessity for removing the sludge proved that there must have been colonies of liquefying organisms actively at work on the crude incoming sewage, and "the great instability of the organic compounds that come over from these tanks is the principal feature of the process" (Rideal, 2nd ed., p. 250). Kenwood and Butler have pointed out that this upward cultivation tank has advantages over a septic tank in which there are no surfaces provided for the organisms. In addition to the instability referred to, there is a greater conservation of nitrogen in the effluents compared with the results obtained from septic tanks. This was fully proved both at Ashtead and at Caterham, where, in the first case, the nitrates in the final effluent averaged 9 parts per 100,000, and from the much stronger sewage at Caterham 14·67 parts in an average of 12 samples (Rideal, 1st ed., pp. 187–189).

The resolution of organic matter in sewage, whether in open tanks or in cultivation tanks, is associated with two characteristic features, viz., a rise in temperature and an evolution of inflammable hydro-carbon gases. It is the latter that accounts for the clearing away of the organic carbon as a cause of secondary putrefaction in good bacterial effluents; and when the ratio of the oxidised to the unoxidised organic nitrogen in an effluent is sufficiently high, the organic carbon as a polluting element becomes practically negligible, and has even ceased to be estimated at all in recent analyses.

At the same time difficulties may arise from the presence of organic carbon in isolated cases, and this estimation should never be disregarded where secondary putrefaction is persistent in any effluent.

I have only one analysis in connection with the Ashtead experiments which deals with the organic carbon. This was made by the late Sir Edward Frankland, and shows that the amount was practically negligible in the highly nitrified effluents.

It should be noted that the work of breaking down organic matter in

the anaerobic fermentation is done not only by the putrefactive organisms directly, but by their enzymes as well. One of my earliest experiments proved the efficacy of the latter, and it is unfortunate that no investigations have been made as to the possibility of utilising the enzymes contained in hydrolised effluents, so as to expedite the process of hydrolysis on the incoming sewage.

There is an immense amount of information available, in the reports and appendices of the Royal Commission on Sewage Disposal and numerous reports by experts, upon resolving tanks and the results obtained from them, but none of these refer to the all-important point as to the best stage of the putrefactive fermentation at which the process should be changed so as to meet the requirements of the aerobic and oxidising organisms. This information can easily be obtained by means of an apparatus which will be fully described later on. Before leaving the subject of the second or hydrolytic stage it may be well to refer to a point which has recently been raised, about the tendency of organic matter in solution to become particulate and to accumulate upon surfaces with which it comes in contact. This, no doubt, does occur; but the suggestion that, in this form, the organic matter is no longer susceptible to rapid nitrification under favourable conditions is untenable.

The third or nitrifying changes which are the principal subject matter of the paper, and the first point to be noted is that the two chief features of this stage are the reverse of those of the second stage, seeing that they are associated with a fall in temperature and an evolution of gases which inhibit combustion.*

In order to do this it will be necessary to refer in considerable detail to the original experiments at Ashtead, because, so far as I know, they are the only ones in existence (although made nearly ten years ago) in which the process of nitrification is shown in detail. I shall afterwards refer to experiments made at Staines and Keighley with an apparatus designed for the purpose of making more accurate estimates of the different factors involved than those which were available in the first investigation. It should be noted that the sewage used in the Ashtead

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* "The question of the filtration of sewage has always been complicated by two elements that are not by any means contradictory. On the contrary, they are supplementary to each other, one being to provide favourable conditions for the work of the nitrifying organisms, and the other providing an environment unfavourable to the development of fibrous and gelatinous growths, which are inimical to the work of purification and tend towards the choking up and destruction of the filters."—*Presidential Address to the Association of Sewage Works Managers, March 28th, 1903.*

experiments was of a peculiarly typical kind because the conditions were not complicated by any previous action having taken place in a sewer. The sewage arrived at the cultivation tank fresh, and all the transformations that occurred were carried on within the limits of the apparatus.

The material employed was gasworks coke, broken to a gauge of about 1 in. to $\frac{1}{8}$ in. particles, and the important feature of these experiments, as giving a clue to the full solution of the problem of purification by purely bacterial agencies, is that the degree of nitrification arrived at was much higher than has been obtained from any other process whatever. As a matter of fact, the ratio of oxidised to unoxidised nitrogen in some of the Ashtead effluents was actually higher than in that of water from the Thames, taken above the intakes of the water companies. It may seem extraordinary that such clues to final success should have been so persistently overlooked by other workers for ten years, but it is not so strange when it is understood that a great impulse had been given to the employment of less scientific systems by their having found able advocates, who had a strong interest in their adoption. It is only now, after years of costly failure, that attention is being given to more rational ways of dealing with a problem which is perfectly intelligible when properly approached.

The arrangement of trays is admitted to be of a kind that is not practical on a large scale, but it has fulfilled an important part in clearing up the details of what actually occurs in a properly constructed filter, and it was obvious all along that the same results could be obtained in a continuous filter in which the action is really as zonal as in the case of the trays, and in which an equally adequate air supply can be provided by other means. Having devised the trays, it at once occurred to me that it would be easy to make a sort of indicator diagram of what takes place, and the changes shown in Table I. are repeated in a graphic form in Fig. 2.

In the first place, it should be noted that the rate of flow in the Ashtead experiments was at the rate of 1,000,000 gals. per acre per 24 hours, and the period of rest between each discharge was $7\frac{1}{2}$ minutes. These factors, regulated in the ratio referred to, were essential to obtaining the high nitrification spoken of; and I have never ceased, when an opportunity has occurred, to point out the necessity of knowing what these two factors ought to be in every case in order to arrive at a reliable basis upon which to design works for producing any desired standard of purity in a final effluent on a large scale.

From the experience gained at Ashtead and Caterham there is reason

TABLE I.—*Showing successive stages of Mineralization by Nitrifying Organisms.*
Ashtead Experiments, February, 1898.

Description of Samples.	A Chlorine.	B Free NH_3	C =N	D Albuminoid NH_3	E =N	F Oxygen consumed.	G O consumed minus O required by Nitrous Nitrogen	H Nitrous Nitrogen.	I = Oxygen required.	J Nitric Nitrogen.	K = Useful Oxygen. N_2O_5 to N_2O.	L Total Oxidised Nitrogen.	M Available Oxygen useful O. Nitrate = O consumed.	N Total Unoxidised N (Kjeldahl).	O Total Organic Nitrogen.	P Total Inorganic Nitrogen.	Q Total Nitrogen of all kinds.
Effluent from Cultivation Tank, taken 3 and 5 p.m.	9·0	12·5	10·30	1·50	1·23	9·843	9·843	Nil.	—	0·12	0·274	0·12	− 9·57	12·35	2·05	10·42	12·47
1. Effluent from First Tray ...	9·0	10 5	8·65	1·25	1·03	6·694	5·56	0·99	1·13	0·096	0·219	1·036	− 6·47	11·5	2·85	9·74	12·59
2. Effluent from Second Tray.	8·5	9·0	7·42	1·00	0·82	5·773	4·74	0·90	1·03	0·48	1·09	1·38	− 4·66	11·10	3·68	8·80	12·48
3. Effluent from Third Tray...	8·5	5·0	4·12	0·60	0·49	4·493	3·60	0·78	0·59	1·87	4·27	2·05	− 0·22	6·60	2·48	6·77	9·25
4. Effluent from Fourth Tray.	8·0	4·0	3·3	0·35	0 29	1·728	0·98	0·66	0·75	2·76	6·30	3·42	+ 4·58	5·15	1·85	6·72	8·57
5. Effluent from Fifth Tray...	7·75	1·5	1·24	0·15	0·12	1·28	0·73	0·48	0·55	4·68	10·70	5·16	+ 9·42	1·75	0·51	6·40	6 91
6. Effluent from Sixth Tray...	8·0	1·75	1·44	0·35	0·29	1·497	0·92	0·51	0·58	4·416	10·10	4·926	+ 8·61	2·25	0·81	6·37	7·18
7. Effluent from Seventh Tray	7·5	0·35	0·29	0·30	0·25	0·755	0·755	Nil.	—	6·6	15·08	6·6	+14·33	0·85	0·56	6 89	7·45
8. Effluent from Eighth Tray.	7·5	0·20	0·165	0·65	0·53	0·397	0·397	Nil.	—	7·32	16·73	7·32	+16·34	1·03	0·865	7·48	8·35
9. Effluent from Ninth Tray..	7·5	0·25	0·206	0·60	0·49	0·589	0·589	Slight trace	—	9 0	20·0	9·0	+20·1	0·60	0·394	9·21	9·60

Colonies of Aërobic Nitrifying Organisms. (Samples 1–9)

ASHTEAD EXPERIMENTS, SHOWING PROGRESSIVE NITRIFICATION.

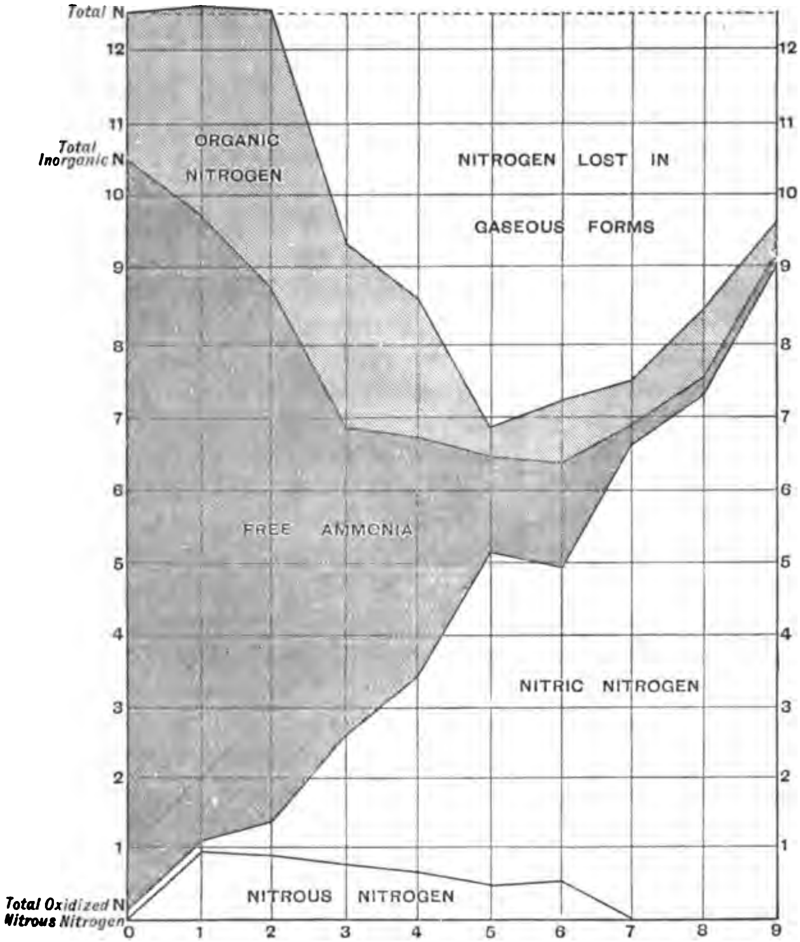


Fig. 2.

The vertical figures are the parts per 100,000.
The horizontal figures indicate the nine trays, containing coke, between each of which there was a clear space of about two inches.

to believe that the rate of flow, within certain limits, should be proportional to the amount of organic nitrogen in different sewages.

At Ashtead the high results obtained were from a flow of one million gallons per acre per twenty-four hours, but at Caterham, with three times the amount of organic nitrogen in the sewage, the flow had to be reduced to one-third in order to obtain corresponding results.

The only other factors to be considered are the quantity of air required to produce the required oxidising changes, and the depth of the filter that produces the required result. It is only now that this knowledge is being recognised as essential.

Before going on to deal with the various changes shown in the table and diagram, it will be well to make a few observations with regard to what goes on upon the surface of all percolating filters, whether properly designed or not. This element of the surface conditions is obviously common to all, and can only be varied by a difference in the size of the materials employed in each case. It is also evident that, if the filters are to go on working without organic matter accumulating in their interstices, some provision must be made to prevent accumulations from occurring. The only way in which this can be done is to allow a sufficient time to elapse between the discharges, so as to provide for the liquefaction of the organic matters in suspension, so that no more may pass into the body of the filter than the lower zones can dispose of. It will be clear that while the lower trays or zones may each be capable of fulfilling their functions with great rapidity, this is of little importance if the surface, which is always being washed by the incoming sewage, is unable to overtake its necessary work. Here we have the supreme necessity for periods of rest sufficient to prevent accretions of organic matter from clogging the top surface of filter beds, and all that can be said about the Ashtead results and others is that a period of 7½ minutes has proved sufficient to prevent accumulations of any kind. Mr. Hall informs me that a period of even less than 7 minutes in summer was sufficient for dealing successfully with the sewage at Staines, but that, when the October brewings commence in a large brewery discharging into the sewers, it was found necessary to increase the periods of rest to as much as 15 minutes, so that the surface conditions could deal with the heavier duty imposed upon them.

At Hanley marvellous results have been obtained with small particles over a period of three years without interruption of any kind; the sewage is a weak one, but the same size of material was proved to be worse than useless at Staines. The period of rest which I had suggested of 7½

minutes, as in the Ashtead experiments, was adopted at Hanley. A proposal has been given effect to by official sanction, that the depth of a filter may be increased to as much as 12 feet, in the belief that a quantity of sewage may be delivered on the filter corresponding to the depth. That is to say, if a filter 3 feet in depth can successfully deal with 100 gallons per yard per 24 hours, a filter 6 feet in depth is equally capable of dealing with a flow of 200 gals. per yard, and so on up to such a depth as 12 feet. This may possibly be true for filters composed of large materials throughout, including that upon the surface, but, as it ignores the surface conditions, it cannot possibly be right for the weaker kinds of sewage, in which fine particles give the best results, as at Hanley, because it would cause pooling of the sewage on the surface and a complete upsetting of the whole process, with a probable destruction of the bed as regards its bacterial activity.

I now deal with the changes which occur in the organic nitrogen as the sewages percolate through the filter.

In the light of recent knowledge I should be in a better position to answer certain questions put by members of the Royal Commission in 1898. What puzzled the scientific members of the Commission can be seen on the table of analyses and also on Fig. 2. It will be noticed that while there was a fairly uniform rise in the quantity of nitric nitrogen, showing progressive mineralisation of the organic matters in the sewage, there was *pari passu* an increase, at certain stages of the transformation, in the amount of the albuminoid ammonia. The two changes seemed so inconsistent with each other, and were so difficult to explain, that it was suggested by a member of the Commission that they threw a doubt on the validity of the analyses.

I had already arrived at a probable explanation of these apparently contradictory conditions, when the same results occurred in using a sewage-testing apparatus at Staines, and later on at Keighley. In the tabulated analyses of the Keighley sewage, which are shown in Table III., the phenomenon of the synchronal increase of albuminoid ammonia and nitric nitrogen are underlined, and the figures that puzzled the members of the Royal Commission are shown under columns D and J in the Table on page 122. In order to understand what takes place and to see how these apparent anomalies bring out the facts, it is necessary to realise that the organic nitrogen to begin with is in a state of greater and less susceptibility to the disintegrating biolytic forces which are at work. This important point is dealt with by Dr. Rideal in his "Sewage and Sewage Purification," where it is shown that "the or-

ganic nitrogen is always higher than the nitrogen as albuminoid ammonia." It is evident, then, that a part of the total nitrogen is refractory, and an increase of albuminoid ammonia taking place, concurrently with a rise in the quantity of nitric nitrogen, produced *during* the progress of bacterial oxidation, shows that the refractory nitrogen at certain stages is being broken down to albuminoid nitrogen more rapidly than the albuminoid ammonia is being broken down to nitrogen as nitric acid. This accounts for a rise in the albuminoid ammonia at the point or points in which the double transformation goes on concurrently. The importance of having investigated the various zones in which these transformations occur is clearly shown by this question of the refractory nitrogen being now capable of explanation; and the phenomenon that was so puzzling to the members of the Royal Commission having occurred in three widely different cases shows that in all probability it is a characteristic feature of the process.

Referring again to the tabular lists of analyses from the sewage of Keighley, one element of importance is the irregularity in the total solids. These are underlined, and arise from the varying quantities of brown residual ash which come away at the time of drawing a sample. The fact that the increase in total solids in no way affects the other constituents indicated by analyses shows that this increase consists only of a neutral ash. The increases in albuminoid ammonia are also underlined, and have already been explained.

It appeared to me evident that the facts obtained from the Ashtead experiments provided a sufficient clue to a solution of the problem in so far that no necessary factor was wanting, and it only remained to devise some apparatus which would enable the factors to be accurately measured under standard conditions.

The work of the pioneer is never an easy one, but at Staines I was fortunate in dealing with a case in which the local authority were at their wits' end, after repeated failures, with the near prospect of bankruptcy on account of their sewage, and you will, I hope, be able to judge for yourselves, when we visit the installation this afternoon, how this apparatus got them out of all their troubles.*

I am indebted to Mr. Lowcock for having supplied diagrams, on the same lines as the original Ashtead chart, of several results upon which I have to make the following observations. At Ashtead the factors of rate

* The testing apparatus is described and illustrated in the paper on "Standardising of Sewage," published in the Journal of The Royal Sanitary Institute, Vol. XXIV., Part III., p. 460.

of flow, periods between each discharge, and depth of filter were known, but the results obtained from Staines and Keighley are the first cases undertaken to compare two different sewages under standard conditions and in which the factors that produce the results have been accurately measured by two identical appliances. The importance of this, from the point of view of scientific comparison, cannot be overrated, because, in addition to the differences shown by the analyses in the chemical composition of the two sewages, we have for the first time an accurate knowledge of the conditions which produced the effluents. The difference between the sewages, as shown in the two charts, are the real differences in terms of the measured conditions which produced the difference in the effluents.

A most interesting object lesson is available in the diagrammatic representation of the results obtained at Hanley, taken from the analyses after the works were completed. Here we find that the diagramatic indication of nitric nitrogen, after the first two feet, runs in a straight line, proving that the lower three feet were unnecessary, and showing the folly of constructing works without knowing the conditions beforehand. In this case it is admitted that a large sum of money has been wasted.*

The diagrams from Buckhurst Hill are interesting as showing how results obtained from unmeasured conditions are valueless, either from the point of view of constructing works or for the purposes of comparison. In this case there is no record of the period between each discharge, and it is obvious from the diagrams that the distribution must have been very defective. Unless standard conditions are provided in every case, scientific comparison and the knowledge obtained from comparison are impossible.

At the time of the Ashtead experiments, in 1897, there were no appliances available for reproducing the results upon a large scale, and one of the first problems to be solved was that of accurate distribution. A great deal of attention has since been given to this all important question. The two main types of distributors are those for circular and for longitudinal filter beds. One of each of these is shown on Figs. 4 and 5. The first I designed in 1899, and this was adopted by Mr. Wilcox, with a few modifications, at Hanley, and has given excellent results. The other, which I designed about the same time and which was made unnecessarily heavy, has been at work for several years, both at Hanley and Birmingham, and in both cases has given the best effluents produced. It embodies an arrangement by which the different areas to be covered at each point of the revolving radius are provided for by means of two

* See Dr. Reid's Report to the Staffordshire County Council, August 7th, 1906.

Sewage Distributor for Bacterial Percolation Beds.

Efficiency 500,000 gals. per 24 hours.

Fan efficiency 20,000 cub feet of air per minute.

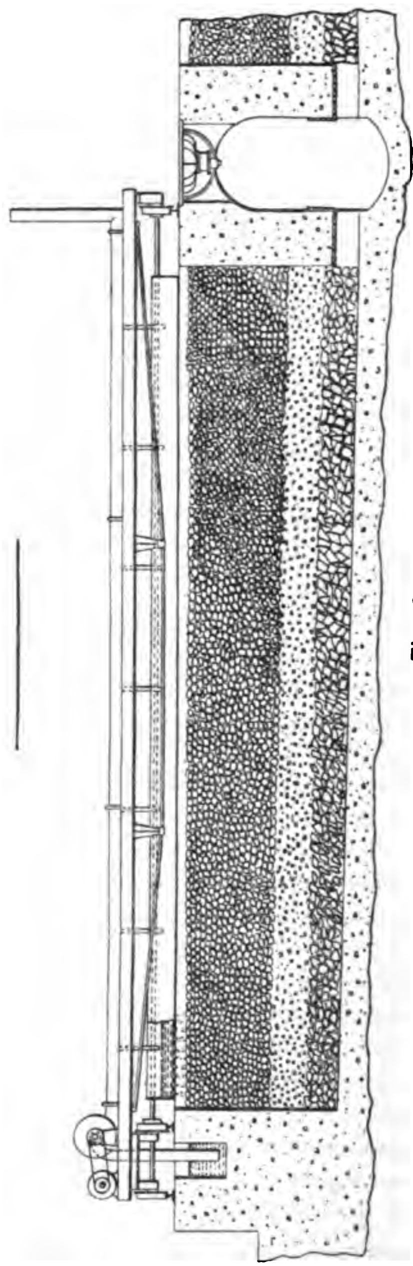


Fig. 4.

SECTION OF REVOLVING ARM.

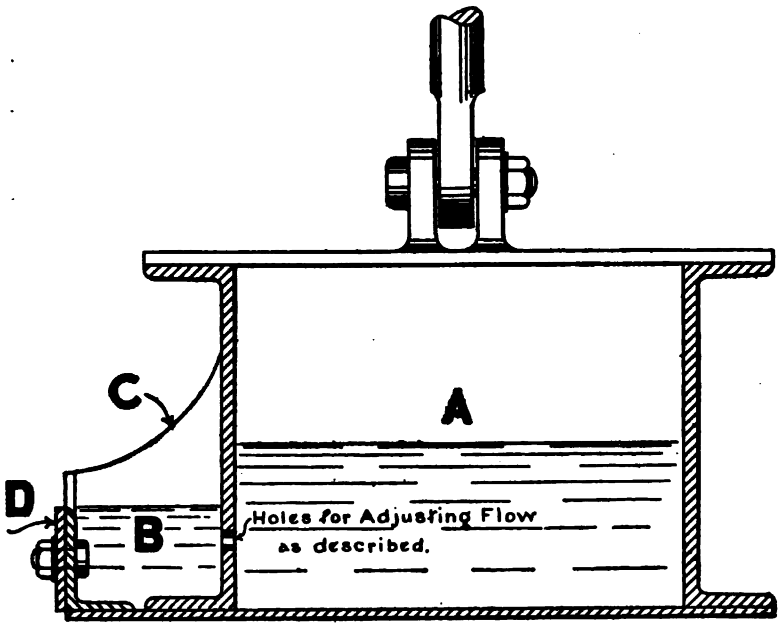


Fig. 5.

A, Main conduit; B, Distributing channel; C, Dividing plates; D, Cast-iron plates slotted raising and lowering weirs in 6-foot lengths.

parallel channels running from end to end of the arms; one of these acts as a continuous duct, communicating at short intervals through the dividing plate with the outside channel, over the edge of which the distribution takes place; the greatest accuracy being obtained by means of adjustable weirs. The outer channel is also divided into short sections, each of which has a different-sized opening into the main channel corresponding with the quantity of liquid to be delivered at each point of the radius. A section of this arrangement is shown in Fig. 5.

As a means of testing accuracy of distribution I know of no better appliance than a shallow box 1 sq. foot, which is placed on the surface of the filter bed, so as to receive the sewage from the distributing arm every time it passes over it. When the time is regulated to a discharge taking place over any given point every 7½ minutes, and when the flow is regulated to the rate of 1,000,000 gallons per acre per 24 hours, then the testing box should contain just 1 gallon at the end of an hour. This is an excellent method of testing accuracy of distribution, and shows that a square foot is just as good as any other unit, even in the largest installa-

Continued on p. 134.

BOROUGH OF

TABLE III.—*Tabular Lists of Analyst's Reports on Experiments*

W. H. HOPKINSON, A.M.INST.C.E., Surveyor.

Date. 1905.	Number of Sample.	Where taken from.		Total Solids.	Oxygen absorbed in four hours at 80 deg. Fah.	Nitrites as Ammonia.	Nitrates as Ammonia.	Free and Saline Ammonia.	Albuminoid Ammonia.
July 28	15	Tank effluent ...	... ...	40·0	2·619	Nil	Nil	1.80	0·848
	16	Filter effluent from	4ft. tap	48·0	0·515	Nil	0·702	0·340	0·248
	17	„ „	5ft. tap	48·0	0·343	Nil	0·874	0·240	0·248
	18	„ „	6ft. tap	52·0	0·303	Nil	0·819	0·540	0·2[illegible]8
Aug. 11	19	Untreated sewage	... ...	76·0	4·215	Nil	Nil	3·25	0·912
	20	Tank effluent ...	... ...	74·0	3·905	Nil	Nil	3·19	0·650
	21	Filter effluent from	4ft. tap	70·0	0·966	Nil	0·493	0·45	0·217
	22	„ „	5ft. tap	66·0	0·328	Nil	0·493	0·340	0·212
	23	„ „	6ft. tap	54·0	Nil	Nil	0·466	0·370	0·234
„ 25	25	Untreated sewage	... ...	136·0	7·818	Nil	Nil	5·100	1·072
	26	Tank effluent ...	... ...	74·0	3·310	Nil	Nil	2·732	0·532
	27	Filter effluent from	4ft. tap	62·0	0·283	Trace	0·922	0·400	0·248
	28	„ „	5ft. tap	58·0	0·318	......	0·967	0·220	0·138
	29	„ „	6ft. tap	52·0	0·283	Mere trace	1·176	0·240	0·198
Sept. 8	31	Untreated sewage	... ...	85·0	4·830	Nil	Nil	2·950	0·604
	32	Tank effluent ...	... ...	66·5	4·603	Nil	Nil	2·868	0·512
	33	Filter effluent from	4ft. tap	67·5	0·429	Slight trace	1·201	0·310	0·108
	34	„ „	5ft. tap	60·0	0·477	Trace	1·120	0·180	0·168
	35	„ „	6ft. tap	50·0	0·413	Slight trace	1·174	0·480	0·128
„ 15	37	Untreated sewage	... ...	80·0	6·676	Nil	Nil	4·00	0·780
	38	Tank effluent ...	... ...	52·0	3·307	Nil	Nil	2·40	0·448
	39	Filter effluent from	4ft. tap	74·0	0·692	Trace	1·320	0·26	0·228
	40	„ „	5ft. tap	58·0	0·569	Slight trace	1·010	1·52	0·228
	41	„ „	6ft. tap	60·8	0·401	Nil	0·954	0·80	0·228
„ 22	43	Untreated sewage	... ...	78·0	5·288	Nil	Nil	3·95	0·948
	44	Tank effluent ...	... ...	58·0	2·898	Nil	Nil	2·00	0·408
	45	Filter effluent from	2ft. tap	80·0	0·982	Nil	Trace	1·50	0·328
	46	„ „	4ft. tap	78·0	0·457	Slight trace	0·928	1·10	0·368
	47	„ „	5ft. tap	90·0	0·525	Trace	1·038	0·82	0·268
	48	„ „	6ft. tap	76·0	0·525	Nil	0·617	1·40	0·248
„ 29	49	Untreated sewage	... ...	92·0	6·615	Nil	...	2·90	1·008
	50	Tank effluent ...	... ...	64·0	2·564	Nil	Nil	1·20	0·464
	51	Filter effluent from	4ft. tap	70·0	1·795	Trace	Nil	1·60	0·36[illegible]
	52	„ „	5ft. tap	58·0	1·844	Nil	0·192	1·50	0·40[illegible]
	53	„ „	6ft. tap	56·0	1·190	Nil	0·311	1·65	0·38[illegible]
Oct. 6	54	Untreated sewage	... ...	72·0	6·159	Nil	0·168	2·800	1·2[illegible]
	55	Tank effluent ...	... ...	48·0	2·914	Nil	Nil	1·200	0·4[illegible]
	56	Filter effluent from	4ft. tap	42·0	0·629	0·070	Nil	0·220	0·3[illegible]
	57	„ „	5ft. tap	62·0	0·514	0·028	0·688	0·240	0·26[illegible]
	58	„ „	6ft. tap	48·0	0·397	0·017	1·130	0·220	0·3[illegible]
„ 13	59	Untreated sewage	... ...	82·0	6·360	Nil	0·741	3·520	1·34[illegible]
	60	Tank effluent ...	... ...	60·0	2·627	Trace	0·168	2·200	0·54[illegible]
	61	Filter effluent from	4ft. tap	76·0	1·197	0·067	0·192	0·380	0·3[illegible]
	62	„ „	5ft. tap	68·0	0·450	0·039	1·210	0·140	0·20[illegible]
	63	„ „	6ft. tap	60·0	0·482	0·018	1·348	0·160	0·20[illegible]

KEIGHLEY.

with the "SCOTT-MONCRIEFF" *Sewage Testing Apparatus.*

F. W. RICHARDSON, F.I.C., Analyst.

Per cent. Purification on Oxygen absorbed.	Per cent. Purification on Albuminoid Ammonia.	Average Purification.	Total Nitrogen as Ammonia.	Unoxidised Nitrogen as Ammonia.	Oxidised Nitrogen as Ammonia.	Per cent. Oxidised Nitrogen based on Total Nitrogen.	Remarks. Material, Gasworks Coke, gauged 1¼in. to ⅜in.	Number of Sample.
...	...	...	...	...	...	...	Pumping from 140ft. of tank. Air cistern not working since July 14th. Rate of flow, 1,000,000 gallons per acre per day.	15
...	...	...	...	...	...	...		16
...	...	...	...	...	...	...		17
...	...	...	...	...	...	...		18
...	...	...	...	...	...	...	Pumping from 140ft. of tank. Air supply, 33 galls. of air to 1 gall. of sewage since July 28th. Rate of flow, 1,000,000 gallons per acre per day.	19
7·35	28·73	18·04	...	...	...	...		20
77·08	76·21	76·64	...	...	...	...		21
92·22	76·75	84·58	...	...	...	...		22
100·00	75·44	87·72	...	...	...	...		23
...	...	...	...	...	...	...	Pumping from 175ft, of tank. Air cistern not working since Aug. 11th. Rate of flow, 1,000,000 gallons per acre per day.	25
57·67	50·37	54·0	...	...	...	...		26
96·40	76·86	86·13	...	...	...	...		27
96·94	87·14	91·54	...	...	...	...		28
96·94	81·53	88·96	...	...	...	...		29
...	...	...	...	...	...	...	Pumping from 175ft. of tank. Air supply. 33 galls. of air to 1 gall. of sewage since August 25th. Rate of flow, 1,000,000 gallons per acre per day.	31
4·69	15·23	9·96	...	...	...	...		32
91·11	82·11	86·61	...	...	...	...		33
90·12	72·18	81·15	...	...	...	...		34
91·45	78·80	85·12	...	...	...	...		35
...	...	...	...	...	...	...	Pumping from 210ft. of tank. Air cistern not working since Sept. 8th. Rate of flow, 1,000,000 gallons per acre per day.	37
50·46	42·56	46·51	...	...	...	...		38
89·63	70·77	80·20	...	...	...	...		39
91·47	70·77	81·12	...	...	...	...		40
93·99	70·77	82·38	...	...	...	...		41
...	...	...	...	...	...	...	Pumping from 210ft. of tank. Air cistern not working. Rate of flow, 1,500,000 gallons per acre per day.	43
45·2	57·0	51·1	...	...	...	...		44
81·4	65·4	73·4	...	...	...	...		45
91·3	61·2	76·25	...	...	...	...		46
90·0	71·7	80·85	...	...	...	...		47
90·0	73·8	81·9	...	...	...	...		48
...	...	...	...	...	...	...	Pumping from 210ft. of tank. Air cistern not working. Rate of flow to filter, 2,000,000 gallons per acre per day.	49
61·24	53·96	57·60	...	...	...	...		50
72·86	63·88	68·37	...	...	...	...		51
72·12	59·92	66·02	...	...	...	...		52
82·01	62·30	72·15	...	...	...	...		53
...	...	...	5·248	5·248	Nil	Nil	Pumping as above. Air cistern not working. Rate of flow, 500,000 gallons per acre per day (varying from 416,000 to 676,000 gallons).	54
52·68	62·42	57·55	2·339	2·399	Nil	Nil		55
89·78	74·84	82·31	2·570	1·812	0·758	29·49		56
91·65	79·50	85·57	2·926	1·768	1·158	39·57		57
93·55	74·84	84·19	2·115	1·357	0·758	35·84		58
...	...	...	6 614	6·446	0·168	2·54	Pumping from 210ft. Air cistern working irregularly. Rate of flow varying from 401,000 to 570,000 gallons per acre per day.	59
[illegible]8·69	59·16	58·92	3·509	3·317	0·192	5·47		60
[illegible]1·18	73·47	77·32	3·032	1·755	1·277	42·11		61
[illegible]2·92	84·79	88·85	2·503	1·116	1·387	55·41		62
[illegible]2·42	84·79	88·60	2·625	1·287	1·338	50·97		63

Date. 1905.	Number of Sample.	Where taken from.	Total Solids.	Oxygen absorbed in four hours at 80 deg. Fah.	Nitrites as Ammonia.	Nitrates as Ammonia.	Free and Saline Ammonia.	Albuminoid Ammonia.
Oct. 20	64	Untreated sewage	84·0	6·051	Nil	1·320	4·236	0·9
	65	Tank effluent	64·0	2 547	Mere trace	0·168	1·400	0·46
	66	Filter effluent from 4ft. tap	56·0	0·159	0·033	0·192	0·310	0·30
	67	„ „ 5ft. tap	56·0	0·143	0·026	1·065	0·160	0·1
	68	„ „ 6ft. tap	44·0	0·047	0·018	1·132	0·150	0·1
„ 27	69	Untreated sewage	74·0	6·732	Nil	1·010	3·052	0·8
	70	Tank effluent	56·0	4·118	Trace	0·168	1·700	0 6
	71	Filter effluent from 4ft. tap	66·0	0·562	0·038	0·193	0·310	0·2
	72	„ „ 5ft. tap	64·0	0·456	0·023	0·928	0·190	0·1
	73	„ „ 6ft. tap	58·0	0·380	0·011	0·970	0·160	0·1
Nov. 17	74	Untreated sewage	68·0	4·748	Nil	0·901	3·288	0·8
	75	70ft. tank effluent	66·0	4·465	Nil	0·108	2·500	0·80
	76	140ft. „	72·0	4·968	Nil	0·168	2·800	0·7
	77	210ft. „	58·0	3·758	Nil	0·156	2·350	0·5
	78	Filter effluent from 4ft. tap	48·0	0·959	0·081	0·144	1·05	0·3
	79	„ „ 5ft. tap	46·0	0·786	0·066	0·204	9·950	0·2
	80	„ „ 6ft. tap	48·0	0·927	0·057	0·216	1·200	0·2
„ 25	81	Untreated sewage	92·0	6·385	Nil	0·216	3·100	0·76
	82	Tank effluent	58·0	2·564	Nil	0·180	1·700	0 6
	83	Filter effluent from 4ft. tap	56·0	0·939	0·035	0·168	1·700	0·3
	84	„ „ 5ft. tap	52·0	0·669	0·020	0·168	2·100	0·31
	85	„ „ 6ft. tap	70·0	0·621	0·034	0·180	1·950	0·34
Dec. 1	86	Untreated sewage	72·0	6·365	Nil	0·168	3·400	0·74
	87	Tank effluent	48·4	1·873	Nil	0·132	1·800	0·51
	88	Filter effluent from 4ft. tap	48·8	0·619	Trace	0·132	2·300	0·3
	89	„ „ 5ft. tap	45·6	0·492	0·014	0·132	2·100	0·2
	90	„ „ 6ft. tap	46·8	0·460	0 019	0·144	2·024	0·31
„ 8	91	Untreated sewage	72·0	6·524	Nil	0·168	2·500	0·7
	92	Tank effluent	48·0	3·444	Trace	0·108	1·750	0·5
	93	Filter effluent from 4ft. tap	46·0	1·127	0·010	0·120	2·900	0·2
	94	„ „ 5ft. tap	46·0	0·857	0·011	0·110	2·350	0·2
	95	„ „ 6ft. tap	46·0	0·968	0·008	0·121	3·350	0·2
„ 22	96	Untreated sewage	92·0	6·548	Nil	0·136	3·650	0·7
	97	Tank effluent	64·0	3·258	Nil	Trace	1·900	0·5
	98	Filter effluent from 4ft. tap	46·0	2·048	Mere trace	0·120	2·400	0·4
	99	„ „ 5ft. tap	46·0	1·931	Trace	0·144	2·400	0
	100	„ „ 6ft. tap	44·0	1·790	Trace	0·168	2·350	0
Jan. 6, 1906	101	Untreated sewage	116·0	6·383	Nil	0·168	2·950	0
	102	Tank effluent	82·0	4·116	Mere trace	0·048	2·400	0
	103	Filter effluent from 4ft. tap	45·6	1·033	0·009	0·060	1·950	0
	104	„ „ 5ft. tap	48·4	0·800	0·008	0·063	2·050	0
	105	„ „ 6ft. tap	32·0	0·900	0·008	0·064 0·076	2·100	0

Per cent. Purification on Oxygen absorbed.	Per cent. Purification on Albuminoid Ammonia.	Average Purification.	Total Nitrogen as Ammonia.	Unoxidised Nitrogen as Ammonia.	Oxidised Nitrogen as Ammonia.	Per cent. Oxidised Nitrogen based on Total Nitrogen.	Remarks. Material, Gasworks Coke, gauged 1¾in. to ⅝in.	Number of Sample.
...	...	...	6·684	6·516	0·168	2·58	Pumping from 210ft. Air cistern not working Rate of flow varying from 697,000 to 848,000 gallons per acre per day.	64
87·90	48·90	53·40	2·913	2·721	0·192	6·60		65
97·37	66·66	82·16	2·962	1·864	1·098	37·07		66
97·64	79·07	88·35	2·612	1·454	1·158	44·33		67
99·22	79·07	89 14	2·706	1·678	1·028	37·99		68
...	...	...	5·551	5·383	0·168	3·03	Pumping from 210ft. Air cistern working very irregularly. Rate of flow to filter varying from 784,000 to 750,000 gallons per acre per day.	69
38·63	21·27	30·15	3·681	3·488	0·193	5·24		70
91·65	72·85	82·25	2·890	1·924	0·966	33·42		71
93·21	78·51	85·86	3·300	2·307	0·993	30·09		72
94·31	79·64	86·975	2·480	1·568	0·912	36·77		73
...	...	...	4·928	4·820	0·108	2·19	Material, foundry slag, Oct. 30th, ⅝in. to 1¾in. Pumping from 210ft. of tank. Air cistern not working from commencement. Rate of flow, 1,000,000 gallons per acre per day.	74
5·95	3·36	4·65	4·038	3·870	0·168	4·16		75
4·63	5·28	0·32	4·942	4·786	0·156	3·16		76
20·86	28·36	24·64	3·616	3·472	0·144	3 99		77
79·80	60·33	70·06	1·959	1·674	0·285	14·57		78
83·44	68·75	76·09	1·655	1·373	0·282	17·04		79
80·46	65·14	72·8	1·982	1·709	0·273	13·79		80
...	...	...	5·148	4·968	0·180	3·49	Pumping from 210ft. of tank. Air supply, 33 galls. of air to 1 gall. of sewage. Rate of flow, rather under 1,000,000 gallons per acre per day.	81
59·84	20·94	40·39	2·660	2·492	0·168	6·31		82
85·29	53·93	69·61	2·354	2·151	0·203	8 62		83
[illegible]	59·42	74·47	2·737	2·537	0·200	7·30		84
[illegible]	55 50	72·88	2·613	2·411	0·202	7·73		85
...	...	...	4·989	4·857	0·132	2·64	Pumping from 210ft. Air cistern not working. Rate of flow to filter, 1,500,000 gallons per acre per day.	86
[illegible]	31·81	51·19	2·497	2·365	0·132	5·28		87
[illegible]	53·21	71·74	2·835	2·703	0·132	4·65		88
[illegible]	65·24	78·75	2·457	2·299	0·158	6·43		89
[illegible]	58·55	75·66	2·466	2·279	0·187	7·58		90
...	...	...	4·370	4·262	0·108	2·47	Pumping from 210ft. Air supply abcut 22 gallons to 1 gallon of sewage. Rate of flow to filter varying from 1,394,000 to 1,742,000 gallons.	91
[illegible]	30·70	38·95	2·617	2·497	0·120	4·58		92
[illegible]	60·60	71·66	3·410	3·290	0·120	3·52		93
[illegible]	70·10	78·48	2·715	2·583	0·132	4·86		94
[illegible]	66·03	75·59	3·690	3·546	0·144	3·90		95
...	...	...	5·562	5·562	Trace	...	Material, limestone, Dec. 8th, ⅝ n. to 1¾in. Pumping from 210ft. Air cistern not working. Rate of flow varying from 1,144,642 to 896,100 galls. per acre per day.	96
[illegible]	29·88	40·06	2·928	2·808	0·120	4·09		97
[illegible]	43·48	56·10	3·012	2·868	0·144	4·78		98
[illegible]	46·74	58·47	2·995	2·827	0·168	5·61		99
[illegible]	53·80	63·23	2·817	2·649	0·168	5·96		100
...	...	...	5·134	5·086	0·048	0·944	Material, sandstone, Dec. 22nd, ⅝in. to 1¾in. Pumping from 210ft. Air cistern not working. Rate of flow varying from 1,000,000 to about 900,000 gallons.	101
[illegible]	23·30	29·40	4·134	4·074	0·060	1·45		102
[illegible]	69·28	76·54	2·553	2·381	0·072	2·82		103
[illegible]	72·45	79·95	2·543	2·471	0·072	2 83		104
[illegible]	72·45	79·17	2·567	2·483	0·084	3·27		105

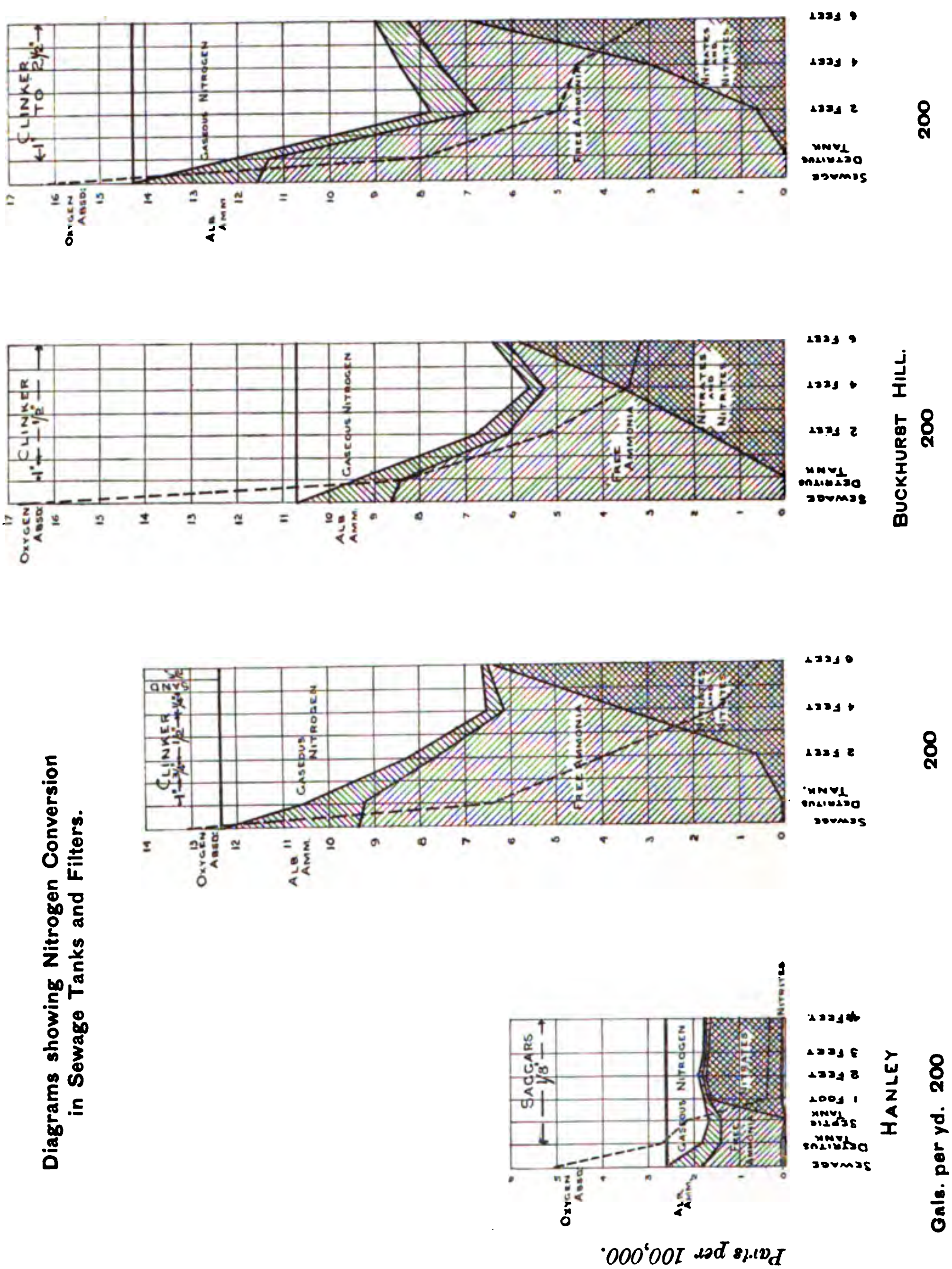
tions. It also demonstrates the fact that the 3 square feet used in the testing machine are just as efficient as a larger area, for the purpose of obtaining information beforehand.

In conclusion, I may say that I have never lost an opportunity of stating the very grave objections which exist, on sanitary grounds and from the point of view of the public health, to the use of appliances which spray sewage into the atmosphere. It has been adopted at Staines because there was practically no alternative, seeing that the existing beds had to be utilised, and in this case there are no houses in the immediate vicinity; but where large installations exist in the neighbourhood of towns I am convinced that they will some day be identified as the immediate causes of the most serious outbreaks of zymotic disease, and that before long they will be prohibited. It is an extraordinary thing if the general community, which has been educated for years into the belief that sewer gas is dangerous to health, should be long content to accept the contradiction that the spray blown from these distributors in high winds, and which contains millions of pathogenic germs, can be breathed with impunity.

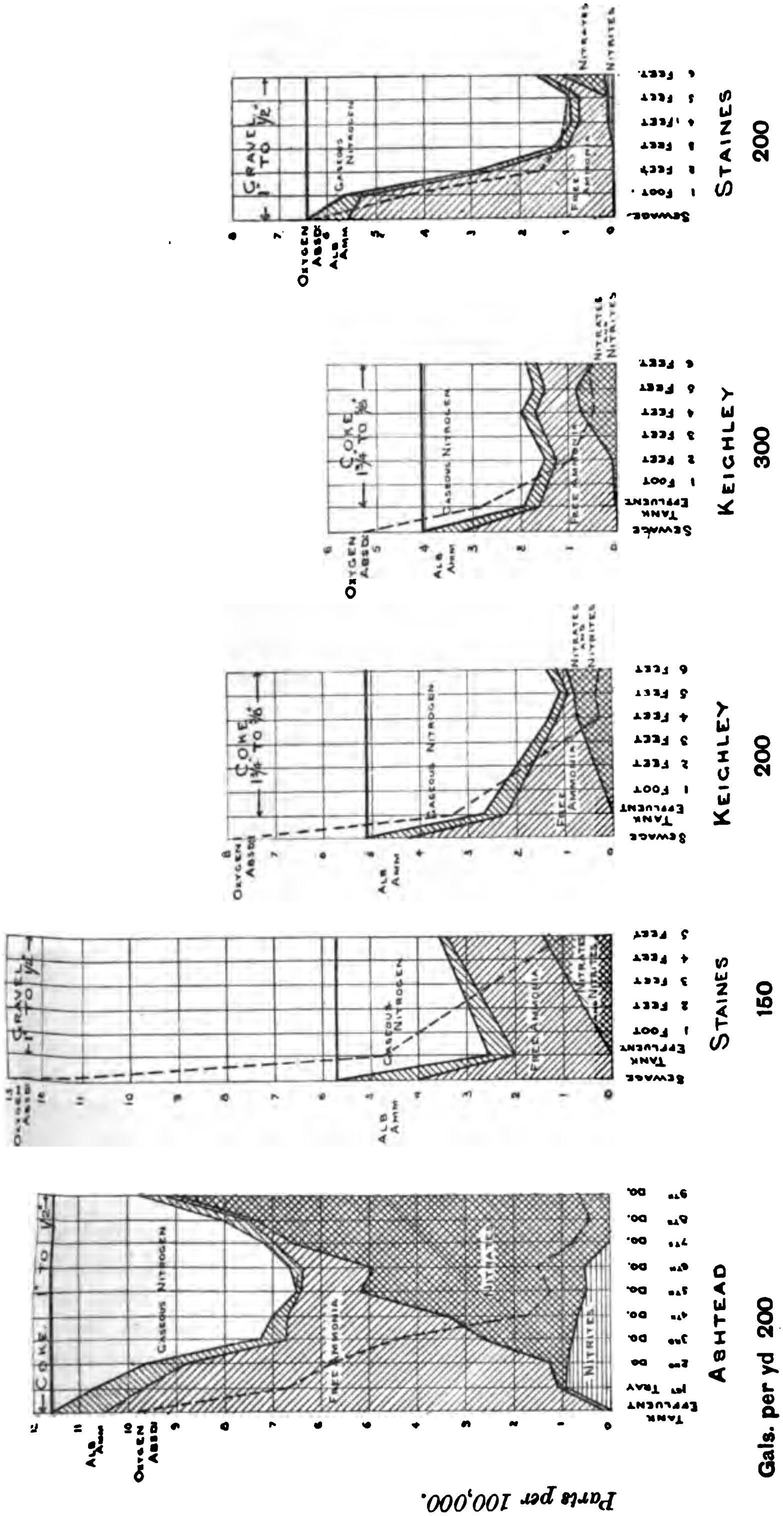
PROF. H. R. KENWOOD (London) congratulated Mr. Scott-Moncrieff on the term "biolysis." He thought that those of them who had had to study the sewage problem during recent years had had to change their minds on many matters, and had been taught not to dogmatise too much on a subject on which they were only on the threshold of correct scientific information. There was one rather dogmatic statement which Mr. Scott-Moncrieff had made which many of them would not be disposed to accept, namely, "The essential character of the completed cycle is that the organic matter contained in the sewage should be delivered to the organisms of nitrification freed, as far as possible, from the presence of the organisms employed in the earlier stages, and also from their enzymes or products." He did not say that that was not true, but he was not acquainted with any scientific facts that would justify it. He thought the suggestion that the sewage which had already been hydrolysed might be used in the hydrolisation of fresh sewage had possibilities in it, and he should like to see the experiment carried out. Failing anyone else, he himself would be prepared to undertake it. The author had drawn attention to the fact that the first stage of the putrefactive process, confined to anaërobic organisms, had lately received relatively little attention. That was true, but he thought they were all changing their views of a few years ago that a long sojourn in the liquefying stage was desirable. Mr. Stoddart's paper, published about a year ago, brought out some interesting facts on the drawbacks of an unduly long retention of sewage in tanks. The Ashtead experiments were classical, and they were indebted to

Mr. Scott-Moncrieff for a great deal of pioneer work there; he thought that they had to a large extent influenced the construction of aërating beds ever since. Of course the trays were impracticable on a large scale, and in many cases on a small scale. As to the remark that the sewage used in these experiments was of "a peculiarly typical kind," much depended upon the point of view from which one regarded the matter, because the sewage one usually had to deal with came through a sewer. Reference had been made to the fact that the albuminoid ammonia increased up to a certain extent in the early stages of the purification of the sewage, and mention was made that the correctness of analytical results showing this had been questioned. He must, however, remind Mr. Scott-Moncrieff that that matter was dealt with from beginning to end, and fully explained, in a paper read by Dr. Butler and himself some eight years ago. With regard to the Hanley experiments, he thought they impressed another lesson they had not yet learned sufficiently, and that was that they could not argue from one sewage to another. It had been too often contended or implied that the results obtained in one place were possible of attainment in another, but every place must take into account its own conditions, and evolve those details of treatment which produce the best possible results under those conditions.

MR. SIDNEY R. LOWCOCK (London and Birmingham), referring to the nitrogen conversion diagrams he had prepared, pointed out that the first was practically the same as the diagram of the Ashtead experiments, except that he had plotted the albuminoid ammonia at the top of the diagram instead of the organic nitrogen, so as to be able to plot comparative diagrams from the results obtained from other filters, the analyses from which gave the albuminoid ammonia but not the organic nitrogen. He had found that where both determinations were given, the organic nitrogen was usually about twice the albuminoid ammonia. Although this form of diagram had been published some time ago by Dr. Rideal, he did not think it was generally understood. It was really a combination of diagrams, all the determinations being plotted in terms of nitrogen. Thus the nitrogen as nitrites was plotted first with the straight line at the bottom of the diagram as the datum—and the ordinates representing the quantity at each point as measured. The nitrates were then plotted, taking as a datum the top of the nitrites diagram, and so on with the free ammonia and albuminoid ammonia to the top. The different lengths of the ordinates therefore gave the quantities of the various constituents at each point, superposed one on another, while the total lengths of the ordinates gave the total nitrogen at each point in the treatment as indicated by the analyses. They did not of course give the absolute quantities, but only so much as was indicated by the results of the analyses. The points shown horizontally along the base line gave the crude sewage, the detritus tank, and hydrolizing tank effluents, and the filtrate at different depths in the filters. The figures at the tops of the diagrams gave the nature and sizes of material of which



Diagrams showing Nitrogen Conversion in Sewage Tanks and Filters.


Staines
200
Keichley
300
Keichley
200
Staines
150
Ashtead
Gals. per yd 200
Parts per 100,000.

the filters were composed. The dotted lines showed the oxygen consumed in four hours at 80° Fahr. The conversion in the tanks and filters was very clearly shown by the diagrams, and they also showed, to some extent (chiefly by the oxygen absorbed line), the relative strengths of the various sewages; but what they showed most clearly was the refractoriness or otherwise of various sewages. So far as he knew, these comprised all the data available with regard to filtrates at different depths in sewage filters; but Dr. Reid had promised him the results of some experiments now being made by another town, and he (the speaker) was arranging with Dr. Barwise for similar observations to be made at works he was constructing and which were nearing completion, so he hoped shortly to be able to carry the matter a little further. He suggested that it would be a good thing to show in a similar way the organic and inorganic matter in suspension, so as to see at once where such matters were precipitated or retained, or broken down; but it would be necessary to have separate diagrams for the tanks and filters, as otherwise they would be unwieldy. The diagrams of Ashtead, Staines, and Keighley were comparable, as the various factors were practically the same in each case; but those of Hanley and Buckhurst Hill were not, as in the former the material was very much finer, and in the latter, although the daily rate of flow was the same, the periods of rest were not. They were sufficiently comparable, however, to show that where fine material could be used the results were better than with coarse; but fine could not be used in all cases, as instanced by the author at Staines, and as found at Buckhurst Hill, although in the latter case he thought the fine material had been put in the wrong place, as his experience was, that if coarse material was placed on the top of fine, clogging always occurred at the junction of the two. It also appeared that the rate of nitrification at Hanley was quite abnormal, as there the rate all occurred in the first foot or so of the filter, while in all the others it was progressive through practically the whole depth of the filter. He showed the diagrams for what they were worth, but they wanted a great deal more information on similar lines before they could attempt to lay down any rules on the subject; and the point he wanted to make was that all the experiments should be carried out on similar lines under standard conditions, so that accurate comparisons could be made. One thing that was shown by the small amount of information they had was that different sewages required different sizes, and apparently the more refractory the sewage the larger should be the material, and this was the opinion expressed in the Columbus, Ohio, report. The great reason that fine material was better, where it could be used, was because it gave a greater area per cubic foot of contents of filter for the cultivation of the bacteria, but to use fine material it was absolutely necessary to remove or break down as much as possible of the matter in suspension in the tanks, as the best of filters would break down if an excess of solids was put on them, and it was therefore a matter of supreme importance to consider what had to be done in the tanks. They used to think that the matters in suspension could be quite easily removed, and that those in solution were the difficulty, but now they were coming to the

conclusion that the matters in solution could be dealt with comparatively easily; the difficulty was to get the suspended matters into solution, or to deal with them if they could not break them down. He was very glad to hear Prof. Kenwood refer to Mr. Stoddart's paper on "Tank Treatment," as very few experiments had been made to find out the proper sizes and forms of tanks, and the best periods of rest in the tanks for various sewages, and he agreed in thinking that they had erred in a great many cases in allowing the sewage to remain too long in the tanks. This was another point on which a great deal more information was wanted. Mr. Watson was also making somewhat similar experiments. On the question of distribution there was still a great deal to be said; accurate distribution and different periods of rest were, he was convinced, essential, and he was being forced to the conclusion that the best results could only be obtained by mechanically driven distributors, which were the only means of obtaining perfect control. He did not think they ought to be so afraid of the expense of these, because, if it could be shown, as he believed in many cases it could, that by more perfect distribution area and depth of filters could be saved, the net result would be a saving in the total cost of the works. Fixed sprays he agreed with the author were an abomination. At Chesterfield they created such a nuisance that they had to be removed and revolving sprinklers substituted, and he did not see why they had been adopted at Staines. They did not give good distribution, and their only merit was cheapness, and like most cheap things they were proverbially nasty.

DR. G. FOWLER (Manchester) said he thought that it could not be too strongly emphasised that they wanted to know a great deal more about the underlying changes which were going on in the process of sewage purification, because on a right understanding of these, the whole success of their expensive works must necessarily depend. An important point was raised by Mr. Scott-Moncrieff in reference to the difference between sewage which came fresh to the works, and sewage which was passed through a length of sewer. Perhaps some of them did not recognise the difficulty until they had experience of the two conditions. Fresh sewage was entirely different to sewage which had passed through some miles of sewers, one reason being that the urea was only partially broken up; so that while a short tank treatment was possible with a sewage which had passed through a considerable length of sewer, it did not follow that the same treatment would suffice with a fresh sewage. He agreed with Mr. Scott-Moncrieff as to the importance of eliminating grease and soap from the tank treatment. There was a possibility of some economic use being made of recovered grease. What they had to bear in mind was not so much the depth of the filters, but the total surface area of the particles, for in a cubic foot of fine material they might very likely have the same surface as in a great many feet of material of, say, an inch gauge. That was the comparison they ought to make, and not that of depth. Experiments should be made as strictly comparatively as possible, only one condition being varied at one time.

Dr. Sommerville (London) said that the great difference of opinion existing, *re* the albuminoid ammonia figure, points to the fact that we know little about it. Another worker and he were engaged at the moment on experiments designed to throw light on the comparative values of different substances used in contact beds, such as coke breeze, polarite, etc. There was already evidence to show that the amount of nitrification in the same sewage varied for different substances and for different temperatures. The whole subject of the oxidation of organic matter required patient and prolonged research on lines scientifically exact; hitherto this complex matter had been in the hands of many who were not exact scientists, and consequently we remained in ignorance of the influence of individual factors; for the future our work must be, as Dr. Fowler puts it, from the simple to the complex. He looked to a great advance in this direction in the near future, based on recent research in bio-chemistry. It was unnecessary to differentiate between changes in the alimentary canal and changes due to putrefaction—both consisted of manifold alternations of reduction and oxidation: bacteria, like animals, digested their food through their enzymes, and the ultimate transformations (as demonstrated by E. Fischer and many others) in digestion and putrefaction are alike enzymic and chemical. We need to know a great deal more about the life histories of putrefactive and nitrifying bacteria and their enzymes before dogmatising on methods of sewage purification.

Mr. H. P. Raikes (Birmingham) made a reference to the point raised as to the tendency of organic matter in solution to become particulate and to accumulate upon surfaces with which it came in contact. This no doubt did occur; but the suggestion that in this form the organic matter was no longer susceptible to rapid nitrification under favourable conditions was untenable. That was rather a general statement, and might be true in some but not in other cases. He could confirm from his own experience what Mr. Scott-Moncrieff had said as to the importance of eliminating grease, but that was not the end of the difficulty. What was to be done with it after recovery? It might sometimes be easier to deal with it in the sewage works than to separate it and to dispose of it elsewhere. Mr. Scott-Moncrieff had remarked that it was only now after years of costly failure that attention was being given to more rational ways of dealing with a problem which was perfectly intelligible when properly approached. But the difficulty was to know what was the proper way of approaching it. In the Ashtead experiments the flow was at the rate of 1,000,000 gallons per acre per twenty-four hours, the period of rest between each discharge being seven and a half minutes. The same rate had been applied in the Hanley experiments for the past five years, but it would be absurd to say that the same interval or rate would necessarily be applicable to other places. It depended on the quality of the sewage, size of media, and a great many other points. As regarded the depth of filters, to which reference had been made, it was, of course, impracticable to double the efficiency simply by doubling the depth of a filter. There

were various ways of getting surface. Mr. Dibdin had suggested slates, but as they had such large intervals between it was doubtful whether they had as much surface area as ordinary material of a smaller size.

MR. SCOTT-MONCRIEFF, in reply, referring to Professor Kenwood's remarks in which he doubted the necessity for delivering the sewage to the nitrifying organisms "freed, as far as possible, from the presence of the organisms employed in the earlier stages and also from their enzymes or products," said that this action should depend upon sufficient aeration and work spontaneously. His point in regard to the question of putrefactive changes was that there was no reason why they should not be measured with the greatest accuracy by comparing the effects of different periods of hydrolysis under identical conditions in the nitrification of the same sewage concurrently in two or more machines. The results could then be read off on the diagrams obtained from them. The Ashtead sewage was a typical one in its own way. With regard to grease, he had long been an advocate for its removal before getting into the drains at all.

DR. S. RIDEAL (London), who was unable to be present, sent the following note:—

The only criticism that I can usefully add to the discussion on this paper, is to the effect that the results recorded in Table I. and Fig. 2, pp. 122–3, which were obtained by me in a professional investigation of the Ashtead Plant in 1898, were, I believe, the first attempt to trace the dispersal of the nitrogen in sewage by biolysis, and the diagram in Fig. 2 showed for the first time, clearly, that in the biolysis of the nitrogenous constituents of sewage, the amount of nitrogen lost in gaseous forms was appreciable.

It also showed that the nitrification takes place at the expense of the free ammonia progressively, the nitrous nitrogen being an intermediate stage, which could only occasionally be detected in a well oxidised filter.

Although this work was done nearly ten years ago, we are still perhaps as far off as ever as to the changes which take place in the conversion of the organic nitrogen into free ammonia. As the organic constituents of sewage are complex and variable, the hydrolytic changes involved are likewise complex and variable, and the problem is one which cannot be completely solved, perhaps, until the chemical constitution of the several organic nitrogenous constituents has been fully worked out by the chemist.

I have not yet had an opportunity of examining, or getting any results from the Scott-Moncrieff Sewage Testing Apparatus, but I feel certain that Mr. Moncrieff's apparatus would be used by many experts as a means of ascertaining the data required before designing a scheme for a new town, if the Local Government Board were prepared to accept the evidence obtained in this way as a justification for modifying their somewhat rigid rules as to the size of the filter-beds required for dealing with a given volume of sewage.

NITRIFICATION OF SEWAGE.

By GEORGE REID, M.D., D.P.H.

(FELLOW.)

THE following is a summary of a paper on the Nitrification of Sewage, by Dr. G. Reid, which was read before the Royal Society on 1st November, 1906, and has since been published in the Proceedings of the Society.

To effect the necessary changes it is essential that the sewage in a fine film shall be brought into intimate contact with the nitrifying organisms in the presence of an adequate supply of oxygen. It follows, therefore, that the larger the number of organisms employed, so long as they are maintained in a healthy active condition, the greater the amount and the better the quality of the work done. How, then, should a filter bed be constructed, so that, within a given cubic space, it shall afford the largest possible surface for bacterial growth under healthy conditions? Clearly, by reducing the particles composing the filter to the smallest size which is found to be compatible with free aeration.

Compare, from the point of view of effective working area, a filter formed of 2″ cubes (a grade in common use at present) with one formed of $\frac{1}{8}$″ cubes, and it will be found that, bulk for bulk, the area in the latter is 16 times greater than in the former, but taking into account the relatively larger space occupied by the smaller particles, the actual gain is as 1 to 14·7.

The question is, then, to what extent in actual practice is it possible to reduce the size of the filter particles?

The author, it appears, has long been satisfied that "percolating filters" give better results than "contact beds" and that fine medium is more efficacious than large. In order to ascertain the work actually done at different depths, he made use of a fine-grain percolating filter ($\frac{1}{8}$″ particles) which had been in constant use for over three years, producing a high class effluent at the rate of 200 gallons per 24 hours.

It would seem to be established that the nitrification of hydrolysed

sewage takes place in stages, the nitrous change being effected by one set of organisms as a preliminary to the nitric change brought about by another set, and the theory is that the two sets of organisms are located in different layers of the filter. With the view of verifying this, and, at the same time, ascertaining the degree of purification effected at different depths, he determined to tap the filter referred to in such a manner that samples might be collected at different levels. Accordingly, four longitudinal shallow trays, with perforated covers, were placed in the body of the filter, the first at 1 foot from the surface, the second and third at 1 foot intervals downwards, and the lowest 18 inches below the third one, pipes being carried from the various collecting trays through the wall of the filter, to allow of the collection of the respective samples. In order that the results from the lower depths might not be affected by the presence of the trays above, the trays were placed obliquely from above downwards, so that no tray had another in the vertical line above it.

The following figures represent the mean results of a series of analyses, the individual figures of which are given in the detailed tables. The samples were collected at intervals extending over a period of about six months, the filters being steadily worked at the previous rate, namely, 200 gallons per superficial yard per 24 hours, and the delivery being uniform and continuous day and night.

The author comments as follows upon the analytical records:—

1. With regard to the suspended solids it will be noticed that a reduction of 73 per cent. is effected in the detritus tanks, and that a further reduction of 15 per cent. takes place in the septic tank, making a total reduction of 88 per cent., and resulting in an effluent being passed on to the filter containing 7·6 parts per 100,000, exactly one half of which is mineral matter. This suspended matter, it will be seen, is practically all retained in the top layer of the filter, where the organic portion is liquefied, in all probability, by aërobic organisms. The mineral matter, however, must remain in the filter, and in time, no doubt, it will be found necessary to remove the filtering medium to a depth of a few inches for the purpose of washing it; but, so far, after over three years' constant working, no such necessity has arisen. As a matter of fact, if the total suspended mineral solids passing on to the filter during the three years were deposited in a uniform layer over the whole surface, the depth of the coating would be less than 1¼ inch.

2. The reduction of the free ammonia at a depth of 1 foot is remarkable, especially considering the fact that the change has been effected in about 12 minutes, the time occupied by the sewage in passing downward

Parts per 100,000.

Sample.	No. of Records.	Total Solids.	Solids in Suspension.	Solids in Suspension, Organic.	Solids in Suspension, Mineral.	Chlorine.	Free Ammonia.	Albuminoid Ammonia.	Oxygen absorbed in 4 hours at 80° F.	Oxygen absorbed in 3 mins. before incubation at 80° F.	Oxygen absorbed in 3 mins. after incubation (8 days) at 80° F.	Nitric Nitrogen on day of collection.	Nitric Nitrogen, day after collection.	Nitrous Nitrogen on day of collection.	Nitrous Nitrogen, day after collection.	Column necessary to obscure test lines.
																Inches.
Sewage	18	170·9	63·5	28·5	34·9	11·0	2·154	0·972	5·019	1·862	2·176	0·02	0·10	0·029	0·029	0·5
Detritus tank ...	13	118·1	17·0	6·8	10·1	10·0	1·643	0·486	2·726	0·975	1·095	0·02	0·09	0·014	0·022	1·6
Septic tank	16	107·8	7·6	3·8	3·8	9·9	1·716	0·340	2·184	0·836	1·571	Nil	0·09	Nil	Nil	1·5
Filter, 1 ft. ...	16	101·5	0·25	0·16	0·08	9·4	0·036	0·052	0·328	0·093	0·067	1·64	2·07	0·003	0·003	Over 24
„ 2 „ ..	16	101·1	0·09	0·05	0·03	9·5	0·020	0·037	0·286	0·077	0·060	1·82	1·99	0·011	0·007	„
„ 3 „ ...	16	101·8	0·14	0·06	0·08	9·4	0·009	0·031	0·244	0·060	0·052	1·75	1·85	0·005	0·008	„
„ 4·5 „ ...	16	103·5	—	—	—	9·5	0·043	0·027	0·259	0·070	0·039	1·70	1·99	0·005	0·002	„

through the first foot of filter. In the author's experience it is not unusual to find the free ammonia figure reduced almost to an equal extent in effluents from fine-grade filters, but, hitherto, he had no conception that the change was brought about by so shallow a depth of filter.

The rate of travel downwards of the sewage through the filter was found, as the result of several observations, to vary in accordance with the depth as follows:—

From surface	to 1 ft.	......	12 mins.
„ 1 ft.	„ 2 „	......	12 „
„ 2 „	„ 3 „	......	6 „
„ 3 „	„ 4 ft. 6 in. .		5 „
	TOTAL ...		35 „

The free ammonia figure presents one other interesting feature. It will be noticed that the progressive reduction which takes place during the passage downwards through the first 3 feet is suddenly interrupted, a considerable increase in the amount being recorded at a depth of 4 feet 6 inches. Accidental error in analysis does not explain this, for the increase was invariably recorded, and, as a matter of fact, the author verified the accuracy of the results by a second analysis in the case of the first few samples, until it became obvious that no such explanation of the occurrence was feasible.

3. As regards the albuminoid ammonia figure, it will be seen that a highly satisfactory reduction is effected by filtration through 1 foot only. In fact, this figure and the oxygen absorbed and nitric nitrogen figures considered together indicate a very high degree of purification, which precludes the possibility of subsequent putrefactive change.

4. It will be seen that the reduction in the oxygen absorbed is, stage by stage, proportionate to the albuminoid ammonia reduction, and the rapidity of the change in this case also is equally marked.

5. With reference to the oxidised nitrogen the figures are very startling, for not only are they indicative of extremely healthy and active biological conditions, but, considered in relation to the other figures, they also demonstrate conclusively, in the case of the sewage in question at any rate, that the work of purification is practically completed within a few inches of the surface of the filter. Within 12 minutes a foul and offensive liquid is rendered not only clear and non-odorous, but also absolutely stable as regards putrescible qualities, as is proved by the oxygen-absorbed figures before and after incubation. Theoretically, one would have expected to find that the process was a more gradual and progressive one,

nitrites being formed chiefly in the superficial layers of the filter and nitrates in the deeper layers, but this did not prove to be the case. At the same time, the author does not suggest that the change is not gradational, but rather that the two sets of organisms are at work side by side, and in this case the absence of more than a trace of nitrous acid in the 1 foot effluent, although the tests were applied at the moment of collection, may be accounted for by the preliminary stage of the oxidation process being an extremely evanescent one owing to the highly efficient working conditions.

Whether what has been proved to be possible in this case will be found to be equally possible in other cases remains to be seen, and if the answer be in the affirmative, it is unnecessary to point out that the resulting economy in the construction of filters would be very material. Personally, the author is extremely optimistic regarding future possibilities in this direction, and only the other day he had an opportunity of practically applying this recent experience with, so far, most gratifying results, in the case of a stronger sewage and one which contains a considerable amount of brewery waste.

The author, in summing up his arguments and conclusions, says:—

In the first place, two important factors undoubtedly contributed in no small degree to the high quality of the work done: the small amount of suspended matter in the effluent applied to the filter; and the very efficient means of distribution provided.

The oxidation of organic matter already in solution is a comparatively simple process, but to bring about the liquefaction of suspended organic solids takes longer, hence the importance of providing, as far as possible, for their removal by mechanical subsidence or other methods, and their liquefaction by anaerobic organisms as a preliminary process. When septic tank treatment was first introduced, its advocates, in their enthusiasm, predicted that the difficult question of sludge disposal would thus be solved, but experience does not quite corroborate this prediction. In the case in point, the author attributes the satisfactory reduction of suspended solids in the septic tank effluent to the large capacity of the detritus tanks. These were divided into three, two of which were always in use, while the third was emptied for cleansing weekly, and so on in rotation, the whole three being brought into use during rainy periods.

As regards the distribution of the sewage on the filter, it is obvious that uniformity is all-important, otherwise certain sections might be greatly overtaxed, while other sections were working much below their capacity. The distribution in this case was so perfect that frequent tests failed to

establish any appreciable difference between one square yard of filter and another.

As regards the rapidity of the oxidising changes, and the remarkable purity of the effluent after filtration through 12 inches only, the three essential factors in the final changes are time, air, and organisms: and, given a sufficiency of air, the greater the number of organisms present the larger the amount of work done, provided the organic matter, both in solution and suspension, is brought into intimate contact with the organisms. The factor which governs the bacterial population is the area available for growth, and this may be increased by two methods, either by enlarging the cubic capacity of the filter or by subdividing the filtering medium. In the case in point the latter was the expedient adopted, and the subdivision was carried as far as it was thought possible to carry it without preventing the superficial penetration of the suspended solids into the interstices. In view of the results, it is needless to discuss whether the reduction in the size of particles resulted in an inadequate air supply.

The relative amount of carbonic acid in the air of the filter at different depths also shows the highly active oxidising changes which take place in the superficial layers. A series of samples of air aspirated from different depths, by means of iron tubes driven vertically into the body of the filter while in continuous use, yielded the following mean results.

Carbonic Acid in parts per 1,000.

1 ft.	2 ft.	3 ft.	4 ft.
19·5	21·5	20·0	20·0

An interesting fact bearing upon the aeration of the filter was incidentally made apparent by the method at first adopted of collecting the air. The distributor passing backwards and forwards over the filter was found to interfere considerably with the collection of the samples, and, to obviate this, the apparatus was periodically stopped for varying periods during the operation. Owing, however, to extraordinary discrepancies in the results thus obtained, measures were taken to overcome this difficulty and enable the air to be collected without interrupting the regular flow of sewage on to the filter. The results, of which the figures just given are the means, were then found to be remarkably uniform, whereas, in the case of the earlier samples, the carbonic acid varied in amount according to the intervals which elapsed between the stopping of the distributor and the collection, short though these intervals were, from 2·8 to 26·1, showing how free was the current of air through the filter.

If, then, by using fine-grade particles the depth of filter may be

greatly reduced, the resulting economy would dictate such a course, but there is another important consideration, which, other things being equal, tells in favour of shallow filters from the point of view of aeration. The air travels through a filter from above downwards, the direction of the current probably being mainly due to the percolation downwards of the sewage, and its more rapid flow along the effluent drains. The air, therefore, as it passes downwards, carries with it the products of the combustion which has taken place above, and thus has an asphyxiating effect upon the organisms below, and it is possible that even anaerobic fermentation may be revived in the bottom layers. The sudden increase in the free ammonia figure, noted in the case of the effluent from the lowest tray, may possibly be accounted for in this way, because the albuminoid ammonia figure does not represent the total organic nitrogen present, therefore there is an unrecorded margin of nitrogenous organic matter available for the revival of the ammonia change should this explanation of the phenomenon be the correct one.

Be this as it may, however, the phenomenon does not appear to be accounted for by fouling of the deeper strata. At the end of the observations the filter was opened and carefully examined throughout its depth, when it was found that the dark discoloration from deposit was confined to the surface, as was evident from the untarnished appearance of the light-coloured filtering medium below the top 14 to 18 inches. Also, the relative amount of organic solids in the interstices at different depths, ascerained by drying and igniting 10 grammes of the filter particles in each case, supports this contention, as the following figures show:—

Percentage Loss on Ignition of Filter Particles at Different Depths.

6 in.	1 ft.	2 ft.	3 ft.	4 ft.
3·25	0·99	0·65	0·53	0·53

On ignition there was practically no smell, except in the case of the samples collected at the 6-in. and 1-ft. depths, and in the case of these only an odour such as that of burning soil could be detected.

Apart from all theory, however, the fact has been established beyond all doubt that, in the case of the sewage in question, at any rate, the lower two or three feet of filter medium is unnecessary, and, so far as the cost of construction of the filter is concerned, the expenditure might be reduced by about one half. Again from the point of view of cost, another important consideration comes in. It frequently happens that the absence of two or three feet of available fall is the determining factor between a

gravitation and pumping scheme, and in this respect the reduced depth of filter might lead to further economy, not only in capital outlay, but in maintenance charges.

The author concludes by asking the question whether this experience acquired at Hanley may be applied in other cases where the sewage may be of a stronger character? He is not at present in a position to give a positive answer to that question, but if, as is probable, such should prove not to be the case, his observations clearly point to the conclusion that the extra filtering capacity should be provided for by increasing the area rather than the depth of the beds. The three factors in the nitrifying process being a given time, a given volume of air, and a given bacterial population, all these would be supplemented by extending the area in accordance with the combustion which has to be effected, and thereby diminishing the delivery per square yard of filter. He does not suggest that the depth of filters may be reduced to 1 foot, because allowance must be made for the effluent drains, and the few inches of large material on the top of them, but he does suggest the practicability, if a fine medium is used, of reducing the total depth to, say, 2 feet 6 inches.

OBITUARY.

ALLAN MACFADYEN, M.D., B.Sc.

(FELLOW.)

With deep regret we announce the death on March 1st of Dr. Allan Macfadyen at the early age of 46. His death adds one more to that list of medical men who have lost their lives in the cause of science, for it was by an accident that he became infected with Malta fever while working at preparing a serum for the actual prevention and cure of that disease.

Allan Macfadyen was educated at Edinburgh, where he graduated in 1886. He then studied at Berne, Gottingen, and Munich, where he gained a consummate knowledge of chemical and bacteriological technique and that command of the German language which served him so well as a teacher and investigator. From 1889 to 1892, Mayfadyen was a research Scholar of the Grocers' Company and became professor of bacteriology in the College of State Medicine. During this time he took an active part in the inception and foundation of the Jenner Institute, now the Lister Institute, becoming its Secretary and head of the bacteriological department. Last year, he resigned his appointment at the Lister Institute and pursued his researches at King's College and at the Wellcome Laboratories. It is not, however, as an organiser of the Jenner Institute that Macfadyen will be best remembered, but by his experimental work on the intra-cellular toxins of bacteria. As Fullerian Professor of Physiology at the Royal Institution his lectures on cell problems attracted much attention and made him known to many. In this field of research Macfadyen stood almost alone, and had his life been spared there is every reason to believe that his work would have been of the greatest practical value in both the cure and prevention of disease. His anti-typhoid serum had already been begun to be used in some of the metropolitan hospitals, and at the time of his death he had succeeded with the plague endotoxin, by producing a serum of higher anti-toxic power than had been obtained before.

Dr. Macfadyen's connection with The Royal Sanitary Institute is associated mainly with his work on the Committee deputed to report on the standardisation of disinfectants. He was elected a Member of the Institute in February, 1905, and a Fellow in June, 1906. In temperament and disposition Macfadyen was shy and retiring, but the writer, who

had many opportunities of knowing him, can testify to the fine character and gentle nature which he possessed. Essentially a modest man, he was difficult to know, but once you were his confidant, Macfadyen was both a genial companion and a true friend.

Dr. Macfadyen leaves a widow, for whom the deepest sympathy is felt in her great sorrow and bereavement. R. H. F.

DECISION OF COUNCIL ON RESOLUTION PASSED AT THE BRISTOL CONGRESS, 1907.

Recommendation made in the Conference of Medical Officers of Health:

> "That, in the opinion of this Conference, it is desirable that the provisions of the Public Health Acts, which prevent occupation of new houses until they have been certified to have a proper water supply, should be extended to include other sanitary requirements."

The Council considered that the provisions referred to were not of general application, and that the proposed addition to the provisions was too indefinite to be suggested as an amendment to the Acts.

NOTES ON LEGISLATION AND LAW CASES.

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LIGHT.—*Obstruction—Ancient lights—Nuisance.*

The appellant built a house near the respondent's house in a London suburb, and thereby obstructed its ancient lights. In an action by the respondent against the appellant, Kekewich, J., found, as a fact, that the obstruction amounted to a nuisance, but in the course of his judgment said that the room in question was "still a well-lighted room":

Held by Lord Loreburn, L.C., and Lord James of Hereford (Lords Robertson and Atkinson dissenting), that there was evidence to justify the finding as to a nuisance, and that there was nothing in the decision inconsistent with the principle laid down in Colls *v.* Home and Colonial Stores (1904), A.C. 179 (Oct., 1906).

The decision of the Court of Appeal, Kine *v.* Jolly (1905), 1 Ch. 480, affirmed.

Jolly v. Kine, A.C., 1 (1907).

SEWERS.—"*Single private drain"—Pipe receiving drainage from Sewer—Local government—Public Health Act, 1875 (38 & 39 Vict. c. 55), ss. 4, 41—Public Health Acts Amendment Act, 1890 (53 & 54 Vict. c. 59), s. 19.*

Sect. 19, sub-s. 1, of the Public Health Acts Amendment Act, 1890, applies to cases where two or more houses belonging to different owners are connected with a public sewer by a single private drain.

A number of houses in a row, six of which belonged to the respondent, and the rest to other owners, were drained in pairs in the following manner:—Each house of each pair was drained by a separate pipe into a pipe common to both houses, and each of these common pipes discharged into a line of pipes running along in private ground at the rear of the houses, which was connected with the public sewer in a street at right angles to the row of houses. The common pipes, which received the drainage from the respondent's houses, were admitted by the appellants to be "sewers" within the meaning of the Public Health Act, 1875, and not to come within the operation of s. 19 of the Public Health Acts Amendment Act, 1890:—

Held that, even if the said line of pipes were a "single private drain" within the meaning of s. 19, yet, inasmuch as the common pipes, by which the separate drains of the respondent's houses were connected with it, were sewers, the case did not come within the section, the houses not being connected with the public sewer by a single private drain; and that the respondent, therefore, was not liable to contribute to the expense of work done to the said line of pipes under s. 41 of the Public Health Act, 1875. (December, 1906.)

WOOD GREEN URBAN DISTRICT COUNCIL v. JOSEPH. 1 K.B. 182. (1907.)

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POINTS OF INTEREST CONNECTED WITH TROPICAL SANITATION.

By Prof. RONALD ROSS, C.B., F.R.C.S., D.Sc., F.R.S.

Being a Lecture delivered to the Institute on March 1st, 1907.

THE points of interest with which he proposed to deal were the mode of propagation of the three tropical typical diseases, sleeping sickness, yellow fever, and malaria, and the preventive measures adopted to check their spread.

Sleeping sickness was due to a parasite called *Trypanosoma*, which lives in the blood and is carried by the tsetse fly. Similar parasites were found in a large number of animals, in man, fish, and very closely allied parasites could be found in insects. This disease was of the greatest importance, not only because of the mischief it does to animals, but also because it is killing large numbers of men in Africa at the present moment. In a previous lecture given before the Institute he had dealt fully with the symptoms of this disease (Vol. XXIV., p. 241).

Turning next to yellow fever, the lecturer showed the mosquitoes known to carry this disease, viz., the *Stegomyia fasciata*, the ordinary tiger mosquito, so called because it is banded like a tiger and bites like a tiger on every opportunity. The peculiarities are the striped legs. This mosquito is found nearly all over the tropics, but it apparently only carries yellow fever with it in certain parts of America and on the West Coast of Africa, Spain, and so on. It was very curious that yellow fever should not spread all through the world, because the mosquito is always present. But as a fact this disease had been confined to the places mentioned. The history of the discovery of the way yellow fever was carried by mosquitoes was dramatic and startling. Yellow fever was a terrible pestilence, and was sure to attack a stranger coming into a yellow fever country. It occurs

chiefly in the Island of Cuba (the centre of it), Panama, Colon, central tropical America, and thence it spreads into the Southern States of America and along the northern coasts. The mortality was roughly about one in four, so that naturally inhibited emigration into Havana, and did much to impair the efficiency of administration and the general prosperity of the country. Up to about 1883 nobody could conceive how the disease was carried. But then Dr. Charles Finlay, of Havana, a British subject, first suggested that the disease was carried by mosquitoes. He carried out a number of experiments and actually ascertained the fact. He made experiments directly on human beings, and he was able to do this because Spaniards coming to Havana knew they were certain to get the disease, so they went to him to be inoculated and receive proper treatment. Dr. Finlay availed himself of this circumstance, and showed to his own satisfaction that it was the mosquito which carried the disease. He was not able to publish all his results. He did not give absolute scientific proof of his discovery or his great theory; that was reserved to others. But he did find out so much, and his discovery was of the greatest importance to the New World. It was to be hoped that some day the British public would thank or reward him. An American Commission was appointed, consisting of Drs. Reed, Carroll, and others. One of the members of the Commission one day observed a mosquito biting his hand, and said if that mosquito was infected he would be infected. So it proved, and that worthy doctor lost his life. Then the Commission set to work and arranged a number of experiments on human beings, many volunteering for the work because the mortality from the disease was so great. Time would not permit of a detailed description of these experiments, but they were most conclusive. They built a special house and brought Spaniards there, tried to infect them with clothes worn by a yellow fever patient, and so on; while another set of patients were allowed to be bitten by the mosquito. The latter took the disease, and the former escaped, and in this way it was proved that a patient must first be bitten by a mosquito, which twelve days after would become infectious, twelve days being the incubation period for the mosquito. This was confirmed by the Commission sent out by the Pasteur Institute, by the Hamburg School of Tropical Medicine, and others. Final proof has been forthcoming in the fact that the disease has been banished from Havana. Since the last three months of 1901 not a single case has occurred, excepting for a short outbreak last year.

The lecturer pointed out that in these matters the Americans are very

energetic administrators, and do not spare money or labour in dealing with epidemics. The whole staff of the Navy and Army officers were lent to fight the epidemic, with admirable results. In such emergencies American sanitarians were very active, but in regard to normal sanitary measures they were not so good as in England, as was proved by the normal sanitary condition of even such cities as Baltimore and Chicago. He paid a tribute to the excellent and effective work of Col. Gorgas, of the United States Army, who was sent as chief sanitary officer to Havana. Wherever a patient was discovered the first thing was to destroy every mosquito which could possibly have bitten him. The patient remains infective during

Mosquito-proof Houses on Panama Canal Zone.

three days, during which time he may have been bitten by hundreds of mosquitoes, all of which would in time become infective. Roofs would be sprayed and houses fumigated, the method of fumigation being by a mixture of carbolic acid and sulphur. The holes and interstices of the walls had to be covered over with paper, and the operation was very costly, but on these occasions the soldiers helped with the work. They were very energetic, and allowed no one to dispute their will. For instance, one doctor refused to have his house disinfected, as he did not believe that mosquitoes had anything to do with the matter, and a force of soldiers

soon appeared and carried him off to gaol. In this country the sanitary authorities could hardly be so active as that.

The lecturer described the method of enclosing houses with verandahs of wire gauze which was becoming common, and had the advantage of keeping out not only mosquitoes but flies of all kinds. It was being used in British dominions, but strange to say had not been used much in India, although it was becoming more common there. But in America it was costly, for he found that wire mesh that we should pay twopence for in this country would cost a shilling in Panama; whether that was owing to Free Trade or not he could not say. There was also the device of the double door. Panama was on the Pacific side of the isthmus and Colon on the Atlantic side, the journey between the two occupying about four hours. The ocean obtained the name of Pacific because it was always calm from the point at which it could be seen in Panama. The canal was being made, and the lecturer explained that he had visited the spot two years ago in order to study the mosquitoes. The country was thickly wooded, with a light loamy soil, but there was a multitude of little mountains, with marshes between where mosquitoes innumerable could breed. A French company had started there and an admirable survey was carried out, but everything went wrong owing to the terrible mortality, at least 50,000 dying in a short time. When the Americans took on the work a few years ago they wisely saw that the first thing to do was to get rid of the disease, and they appointed Col. Gorgas, who had already got rid of the disease in Havana. Now Col. Gorgas was an officer in the American army and was an admirable sanitarian. He adopted the same methods in Panama as he had employed so successfully in Havana, where the mortality had been much reduced, both from malaria and yellow fever, and there had been no yellow fever in the former, the lecturer thought, since last November or December. The Americans were now quite confident they could keep down the disease. In fact, the amount of disease as compared with what was the case when the French were at work on the isthmus was very small, and apparently the disease had now been got well under control. One of their principal allies was a tiny fish about half an inch long, which was let into all the puddles that could not be drained.

Coming next to malaria, the lecturer referred to the work of Dr. Laveran, who discovered the parasite of malaria, and who is now working at the Pasteur Institute; he was a most distinguished man, whose work had really been the foundation of tropical medicine. The lecturer commented upon the fact that the figures relating to the mortality of malaria were in many cases much below the reality because many patients do not

go to hospital at all, and so are not included in the returns. In some parts it could safely be said that malaria attacks quite one half the population. Such statistics had been obtained from many tropical parts. Other diseases, such as cholera, attacked a smaller number of people, but on the other hand the death-rate was high, though he questioned whether the death-rate from malaria ought not to be put much higher than it is, because malarial deaths were often ascribed to inter-current

Dr. Laveran.

infections, dysentery, pneumonia, etc. For instance, out of the European troops in India, 710 men, equivalent to a regiment, were continually in hospital from the disease. On active service this became a source of great expense, because provision had to be made for those already infected and who fell sick. Malaria was caused by a parasite in the blood, the parasite also being carried by a mosquito. The malaria parasite breeds entirely in

puddles, and in ancient times the idea prevailed that malaria arose from the marshes. The Greeks and Romans knew this, and the Romans knew the importance of clearing away malaria by drainage. Mark Antony, for instance, when seeking election, promised to drain the Pontine marshes, but forgot his promise after he had been returned. There were many passages in Varro indicating knowledge of this fact at that time. Of course, distinction had to be drawn between puddles and artificial collections of water.

The great question for sanitarians in the tropics was the draining away of these puddles. There were several methods of dealing with malaria; one was to drain all the puddles and so prevent mosquitoes breeding; another was to prevent people being bitten by using nets, etc., and another was to use quinine. As practical sanitation, it largely resolved itself into drainage; but in the case of Sierra Leone, it was all hard rock, and in that event the puddle was filled up with rubble and concrete. Of course, these tactics could not be employed in the country and wild districts, but only in the neighbourhood of large towns, etc. The principle was that no stagnant water must be allowed to remain. In the case of Sierra Leone the authorities had not done enough, but were entirely eclipsed by the French at Ismailia, where the French cleared out all the malaria in one year. Some people thought that if a place was cleared of mosquitoes others would come in from the outside. If so, of course, obviously there would be so many less mosquitoes outside, but there were many reasons why mosquitoes were not likely to be carried in that way; besides, if the wind brought mosquitoes, it was also likely to blow them out. This subject had been recently thoroughly investigated by Professor Carl Pearson, following a lecture of mine at the St. Louis Exhibition. Mathematically considered, the chance of the mosquito going on in one direction was very slight, and the conclusion was that the largest number of mosquitoes would remain almost where they started. Pearson named this "the problem of the random walk." In the same way it might be said that if the birth-rate in Great Britain were checked there must be a decrease in the population. Any operation against mosquitoes must decrease their numbers.

And next, turning to Greece, he explained how malaria had been a terrible scourge to this fair country, which was the birthplace of civilization. There the problem was being attacked; eminent men had taken it up, and a fund had been started and £200 had already been sent from this country. Describing the scene of operations at Lake Copias, where drainage works were being extensively carried on, Professor Ross said the infection of the population here was from 25 to 35 per cent., and the

amount of suffering was enormous. The physical characteristics of the country (mountains and valleys) helped the disease, and undoubtedly malaria had been killing Greece since the time of the ancients. It was an interesting speculation as to when malaria entered the country, and it was probably brought in from Africa. In a recent lecture at Oxford he had dealt with the interesting question of the relation of disease, or the effect of disease, on history. This was, in fact, a highly important question. Malaria, especially, had a great influence on a country, and he could not help thinking that malaria had retarded Greece ever since it entered. Greek civilization seemed to fall from the time of Pericles. It may

Breeding Pools of Anopheles in the bed of the River Ilissos at Athens, causing malaria in adjoining barracks.

be that malaria entered and gradually sapped out the life of the country. That it could do so is certain. It entered Mauritius and Reunion in 1866, and did much harm. If they could get rid of malaria from the whole of Greece it would be the climax of their work. He hoped that the interest of the public in this country would be aroused, and he would much like an expression of opinion from that meeting which would help Greece in its struggle against malaria. For this reason, he showed a number of beautiful slides of Greek towns and scenery. If they could only get rid of the malaria from the beautiful valleys of

Greece, the country would be much more frequented by tourists, and the land would be a happier one than it is at present.

The President, His Grace the Duke of Northumberland, in proposing a hearty vote of thanks to the lecturer, said they had all been convinced of the importance of the subject which had been so admirably treated that evening. While they all felt that the subject of tropical medicine was of immense consequence, they would also feel that not only had it a sanitary side but also a political side. Great Britain was the greatest colonising country in the world, and the success of colonisation would in the long run depend upon the success of sanitary efforts in their various possessions. It was true that for a great number of years we had held a large amount of very unhealthy territory, but it was not possible that that position should continue indefinitely, or that we could retain places that were fatal to the people whom we sent out to inhabit them. In some way these countries must be made fit and prosperous. So that this question of tropical medicine was not only a scientific matter, but a matter of deep practical interest to Great Britain. They owed the deepest debt of gratitude to those who had devoted their lives and risked their healths for the attainment of that great object. One thing had struck him during the delivery of the lecture, and that was how little Professor Ross had spoken of his own efforts and work. That work had been conspicuous, not only for the devotion which had characterised it, but also for the great success which it had achieved. Professor Ross had been a pioneer in regard to the study of tropical medicine, and they owed him thanks, not only for his admirable and interesting lecture, but more for the great services which he had rendered to the cause of human life and happiness.

A SKETCH OF THE SANITARY HISTORY OF NEWCASTLE-UPON-TYNE,

being a continuation of a paper read by Dr. H. E. Armstrong at the Congress of the Institute in 1882,

By J. COOTE HIBBERT, M.D., D.P.H.,
(MEMBER),

And W. H. WELLS,
Sanitary Inspector.

Read at Sessional Meeting, Newcastle-upon-Tyne, March 15th, 1907.

DR. J. COOTE HIBBERT.

IN the year 1882, at a Congress of The Sanitary Institute in this city, Dr. Armstrong read a paper on the Sanitary History of Newcastle-upon-Tyne up to that date. In that paper, despite the greater part of the period then dealt with being practically prehistoric so far as hygienic records went, despite the absence or dimness of those scientific searchlights which at the present day enable us to see more deeply into the mystery of disease, there was laid before this association a graphic description of those former times of plague and pestilence. The circumstances attending the birth of this historic city, the many vicissitudes through which it passed during its early years, and the influence which those early years still exerted on the more recent times, the city's embryonic attempts at sanitation and its first efforts to grapple with those devastating epidemics of infectious disease, which in one year carried off even a third of its total population—all these details were passed in review, and a typical picture of those dark ages of sanitation was presented. During the decade, however, which began with 1873, in which year the Newcastle Sanitary Authority first appointed a medical officer of health, the dawn of the modern sanitary era appeared, and at the end of those ten years, a reduction of the yearly death-rate by 10 per 1,000 of the population, and a diminution of typhus fever to a fifth of its prevalence

in the years immediately antecedent to that period, were the first happy augury of better times.

To Mr. Wells and myself has been entrusted the task of continuing this Sanitary History of Newcastle to the present time. For the honour of reading this paper, I am indebted to Dr. Armstrong, from whose thirty-three annual and numerous special reports I have abstracted the facts herein related.

During the last quarter of a century the population of Newcastle has increased from 147,626 in 1882 to an estimated 272,969 for the present year. Towards the end of 1904 the districts of Walker, Benwell, and Fenham, and part of Kenton, with a population of 35,276, and an area of about 3,000 acres, were incorporated within the city boundaries, which now comprise about 8,460 acres.

The general death-rate, which during the five years 1883–87 averaged 24·5 per 1,000 population, has fallen to an average of 19·1 during the five years 1901–05, and to 18·0 last year. Newcastle presents no exception to the general rule of a diminishing birth-rate, the averages being 38·6 and 31·7 per 1,000 population for the two quinquennial periods, and the marriage-rate per 1,000 population shows the same downward trend, with the figures 11·6 and 9·4 respectively for the periods before mentioned.

In no way perhaps has sanitation conferred greater benefits on mankind than in its influence on the prevalence and severity of the infectious diseases, and, fortunately, I am able to give the extent of the chief of these diseases in the city during the years under consideration, as the Newcastle Improvement Act of 1882 contained certain clauses making their notification compulsory. It is remarkable how little opposition was offered, even from the beginning, to those compulsory clauses which have wrought so much for the public good. At first there was some slight protest from certain medical practitioners in the city, but this soon subsided, and the absence of any further friction speaks volumes, I think, for the care and tact with which the Health Department has been administered, and also encourages the further step of including tuberculosis among the notifiable diseases, should that course be considered necessary.

At the beginning of the period I am dealing with, the hospital accommodation for infectious disease was as follows: In Bath Lane there was a building with 24 beds, into which were admitted cases of typhoid, typhus and, to a small extent, scarlet fevers. This hospital also included a block with 24 beds for cases of smallpox, but this part of the building was closed at the end of 1882 when the Moor Smallpox Hospital was erected, a

suspicious outbreak of the disease in Stowell Street, a densely populated locality adjoining the Bath Lane Hospital, probably hastening the closure of the smallpox wards. There was also a convalescent home at Byker for smallpox patients. Even after the opening of the Moor Smallpox Hospital, need of further hospital accommodation for fever cases was felt, the diseases which were especially prevalent being smallpox and typhus, typhoid and scarlet fevers. As regards the extent of the isolation of these diseases, there were admitted into hospital more than half the total number of smallpox cases, nearly all the typhus cases, and under one-seventh of the typhoid cases, but scarcely any attempt could be made to deal with scarlet fever.

In the latter part of 1888 the Bath Lane Hospital was closed, and the present City Hospital at Walker Gate opened, with its four large pavilions and one isolation block, the whole containing 105 beds, and from this time onwards a larger percentage of cases of scarlet and typhoid fevers was treated in hospital.

On several occasions extensions have been made to the Moor Smallpox Hospital, and at the present time the additions to the City Hospital at Walker Gate are approaching completion. Thus, in the course of this summer, Newcastle, with its estimated population of 272,969, will have the Moor Smallpox Hospital and Isolation House, capable of accommodating 70 patients and 100 "contacts," and the hospital at Walker Gate, comprising 6 large pavilions and two isolation blocks, containing 175 beds.

Within a few years, the notification of infectious disease brought to light much useful information as to the spread of infection, and the deduction was soon made that home isolation was impossible among the working classes. Thus, in the year 1884, it was found that 70 per cent. of the infectious disease of the city occurred in tenement property, and to encourage the sending of patients to hospital, the Sanitary Committee in this latter year authorised the free admission of all cases of infectious disease occurring in this class of property or in houses of persons in poor circumstances. In the year 1900 further facilities were offered by the Sanitary Committee for the treatment in hospital of cases of infectious disease, and all classes were admitted to the general wards free of cost, a fee still being charged for private wards. As regards the extent to which cases of diphtheria and scarlet and typhoid fevers have been isolated in hospital during the 5 years 1901–5, the average for patients in private practice was 38·4 per cent. of those notified in this class of practice, and for those notified in public practice, 72·9 per cent.

Apart from considerations of the benefit to the public health, the great advantages offered by the isolation in hospital of cases of infectious disease, both to the patients themselves and to other members of the households, who would otherwise suffer the many inconveniences associated with the treatment of an infectious case in their homes, are being more and more appreciated by the general public; and this appreciation is becoming more marked among the well-to-do classes, who are certainly making greater use of these hospitals than in former days.

On account of the larger percentage of cases recently treated in hospital, and also on account of the extension of the city boundaries, the hospital accommodation for infectious disease in Newcastle has been strained to the utmost during the past few years, and it cannot be said that it will be excessive even when the present additions to the City Hospital at Walker Gate have been completed. There is nothing more liable to bring fever hospitals into disrepute than the overcrowding of such institutions, which is apt to accompany inadequate accommodation, for it is during such times that return cases, instances of cross infection, and severe complicated cases, are especially likely to occur; and probably few, except those who have had charge of such hospitals, can realise the constant anxiety that is involved in their administration under these conditions.

Turning now in detail to the several infectious diseases which have been present in the city during the last 25 years, we have ample evidence of the improvement of the public health, and this is also shown in the fall of the zymotic death-rate from an average of 3·5 per 1,000 population for the 5 years 1883–7 to an average of 1·5 for the 5 years 1901–5. The following table gives for the two quinquennia the prevalence, case mortality and death-rate of scarlet fever, typhoid fever and diphtheria respectively, and the death-rates of measles and tuberculosis.

Disease.	Average Yearly Number of Cases Notified.		Average Yearly Attack-rate per 1,000 population.		Average Case-mortality rate per cent.		Average Death-rate per 1,000 population.	
	1883–7.	1901–5.	1883–7.	1901–5.	1883–7.	1901–5.	1883–7.	1901–5.
Scarlet Fever ...	1351	1107	8·8	4·9	6·5	2·9	0·56	0·15
Typhoid Fever ...	251	57	1·6	0·25	17·9	17·5	0·30	0·04
Diphtheria	72	190	0·47	0·82	29·4	19·3	0·12	0·15
Measles	...	...	...	...	...	...	1·07	0·27
Tuberculosis	...	...	...	...	...	...	3·3	2·5

Average population ... 152,232, 1883–7; 229,370, 1901–5.

From this table it will be seen that scarlet fever shows a marked improvement under each of the headings, and the reduction in the case-mortality rate, when compared with that of typhoid fever and diphtheria, is especially noticeable. Indeed, this mildness of the disease, and the consequent difficulty of detecting and isolating many ill-defined cases, probably in no small degree causes its continuance amongst us.

Typhoid fever, a disease which has so often been found to vary in extent inversely with the thoroughness of the sanitary measures adopted, shows a still more marked reduction in its prevalence and death-rate. Several small outbreaks of the disease during the earlier part of the quarter-century were definitely traced to local insanitary conditions, but with the improvement of these latter and a more systematic isolation of cases in hospital, these outbreaks have practically disappeared.

The most striking anomaly shown by the infectious diseases is in connection with diphtheria. This disease, within the memory of many present, was once rare in our large towns, but it has increased within comparatively recent years in spite of sanitary improvements, hospital isolation, and the most scientific methods of treatment, until it is now one of the chief infectious diseases with which we have to deal. The more accurate means of diagnosis which are now available may to some extent account for the increase in the number of diphtheria notifications, but this is certainly only a partial explanation.

The only source of satisfaction we have in Newcastle as regards this disease is a diminished case-mortality rate, which, however, is still a high one, and contrasts unfavourably with that of London and many other southern towns. From a return prepared by Dr. Armstrong in 1904 of the case-mortality rates of diphtheria in thirty-one large towns of England and Wales, it appears that the type of the disease in the northern districts is more severe than that found farther south, the average case-mortality rate per cent. for the five years 1900–4 being for

18 northern towns	24·7
5 midland towns	15·7
8 southern towns	13·1

Whether this difference in the severity of the disease in the north and south can be explained entirely by the difference in the social conditions which exist in the respective districts, and which may lead to a later detection of the disease in the northern manufacturing towns and a consequent later administration of antitoxin, or whether there is a more virulent strain of the bacillus in the north, giving rise to a more severe

type of the disease, are points worthy of discussion. I would ask bacteriologists whether the different strains of the bacillus may not, even to a slight extent, furnish specifically different toxins, which may not necessarily be neutralised by the antitoxin in general use, this antitoxin, I am informed, being obtained in most laboratories by immunisation with the toxins of a special strain of bacillus, which was imported from another country. In favour of the latter view, I may add that at the City Hospital here, where antitoxin in doses of from 6,000 to 12,000 units is given as a routine treatment, Dr. Harris and myself have not had evidence that antitoxin is the definite curative agent which it has apparently proved itself to be in the hospitals of the Metropolitan Asylums Board. There is, however, this fallacy as regards diphtheria statistics, that at least one southern town includes amongst its cases of diphtheria those "contacts" in whose throats the bacillus is found, but who do not show any clinical symptoms of the disease.

Typhus fever, except for a few sporadic cases, has been absent from Newcastle since 1891, its last appearance in the city being in 1903, when there were three cases, all of which recovered. The history of the last fifteen years differs therefore very markedly in this respect from the records of more remote times, when so prevalent was the disease and so infectious to those brought into close contact with it, that between 1865 and 1872, thirty-one officials at the Fever Hospital contracted the disease, and five of these died. It was on this account the usual practice in those days as far as possible to fill up vacancies among the nursing staff from former female patients who had recovered from the disease. Between 1873 and 1887 typhus fever made its appearance no less than fourteen times, but was each time successfully stamped out.

Smallpox was raging in the city during the first four years of our period. Since then there has been no large outbreak until 1903, when an epidemic began and continued until the middle of 1905, giving rise to 614 cases, and showing a case mortality rate of 4·5 per cent. (2·9 per cent. for vaccinated cases and 10·4 per cent. for the unvaccinated). During this epidemic practically all direct contacts, 2,551 in number, were removed to the Moor Isolation Hospital, adjoining the Smallpox Hospital, where they were retained for from twelve to seventeen days, and during this time compensation was paid to them for actual loss of wages, etc. 3·4 per cent. of these contacts developed smallpox in the Isolation Hospital, and thus the city was saved from the infection of these 86 cases.

Measles, although more or less prevalent during the whole period,

shows a reduced average death-rate per 1,000 population of ·27 during the recent years, as compared with 1·07 during the earlier years. A very instructive experiment was made from August, 1896, to August, 1898, measles and whooping cough being included amongst the notifiable diseases, and 7,680 cases of measles and 3,746 cases of whooping cough were notified, at a total cost of £1,881. In spite of energetic action on the part of the Health Department on receipt of the notifications and the occasional closure of schools, the medical officer of health had to report at the end of two years that "the outcome of notification had certainly not been a general reduction of these diseases," and expressed his opinion that, with respect to measles, the most practical means of preventing large epidemics was to be found in the prompt closure of every school in which the disease should appear.

As regards the several forms of tuberculosis, for the prevention of which disease so little has hitherto been specially attempted, we have nevertheless a steady, even though it may not be a very marked, reduction in the death-rate, for the table shows an average tuberculosis death-rate of 3·3 per 1,000 population in the early quinquennium as compared with one of 2·5 per 1,000 for the recent period. That the more energetic dealing with this disease is becoming one of the chief hygienic questions of the day, that there is much which both can and will be done to diminish this scourge, there can be little doubt. Dr. Armstrong's firm stand in condemning as unfit for food the whole of any tuberculous carcase, despite the butchers' protests that "parts only are affected," has protected Newcastle from this source of infection so far as the difficulty of supervising its many slaughter-houses has permitted. Towards the end of last year, the bacteriological examination of the various milk supplies for the tubercle bacillus was begun, and when adequate legal powers have been obtained for allowing the necessary action to be taken after the detection of the bacilli, another fruitful source of infection will, it is hoped, be cut off. A sanatorium for the treatment of tuberculosis in its initial stages has lately been erected at Barrasford, and the Corporation of Newcastle are considering a contribution to the institution and an arrangement which will enable them to have twenty beds at their disposal.

Recently a special report on tuberculosis, giving a very comprehensive survey of the measures necessary for the thorough dealing with the disease, has been submitted to the Sanitary Committee by Dr. Armstrong.

Having thus briefly referred to the chief infectious diseases which have been prevalent in the city during the 25 years, I will now turn to another

question of great moment, that of infantile mortality. In this respect Newcastle has held a middle position among the large towns, and can show a moderate improvement, the average rate for the five years 1883–7 being 165 per 1,000 births registered, and that for the five years 1901–5 being 155. Since 1901 six health visitors have been appointed, and through them, working in conjunction with the superintendent of midwives lately engaged to assist in the working of the Midwives Act, it is hoped to further reduce the infantile death-rate. Recently the Corporation has offered a fee of 1s. to all midwives notifying within 24 hours the birth of any living child in their practice, and these infants are visited within the first week of birth by the superintendent of midwives, and afterwards at certain intervals during the first twelve months by the health visitors. By the instruction given to mothers by these ladies as to the hygiene of the home and the care of the infant, and by means of the distribution of printed pamphlets on infant feeding, a crusade is being carried on against this loss of infant life. The recently instituted routine bacteriological examination of the city's milk supply cannot but disclose many a danger to which the infant has been hitherto exposed.

Closely associated with this subject of infantile mortality is the work recently undertaken in connection with the Midwives Act, and the utmost importance of this Act, both in giving the health authorities control over the midwives, and also in indirectly affording them opportunities of coming into closer contact with mothers and their young offspring, is becoming most evident. Thus, the superintendent of midwives not only supervises that part of the midwives' work which concerns the mother's welfare, but also encourages the midwives and the mothers to take an intelligent interest in the care of the child. Circumstances which have a bearing on the inability of the mother to suckle her child are especially inquired into, and as far as possible rectified, and in this way the child begins existence under conditions which are at any rate less directly hostile to its survival than those which have hitherto often attended its early days. The compulsory notification by certified midwives of still-births attended by them, and the obtaining of information from the superintendents of cemeteries of all burials of still-born children in the city, enable the health department to investigate the circumstances of each case, and thus not only is a check exercised over any criminal practice, but also opportunity is given for ascertaining and dealing with any maternal conditions which may have led up to the death of the fœtus. The extent of puerperal fever in the city during the quarter century is with difficulty arrived at, for many cases

remain unnotified, but the returns of cases notified show a definite reduction in its prevalence from an average of 11·6 cases per year for the early five years to an average of 4 per year for the recent five years.

There is no more striking feature of the sanitary administration of recent times than the daily practical use to which the science of bacteriology has been put. In the year 1898, the Corporation of Newcastle first instituted a routine bacteriological examination of its water supply, and since 1905, examinations for the diagnosis of tuberculosis, diphtheria and enteric fever have been carried out by the Corporation free of cost for medical practitioners in the city. Last year an arrangement was made with the Durham College of Medicine whereby the Corporation have a far more extended use of the College's bacteorological department, and the routine examination of samples of milk for tubercle bacilli and for organisms associated with dirt was also begun. For the present, valuable information is thus being collected as to the bacterial condition of the various milk supplies, the tubercle-containing milk is traced back to the dairy farm and excluded from the city, and an attempt is made to remedy any insanitary conditions in connection with the production and storage of milk found to contain a large number of organisms indicating the admission of dirt.

That these sanitary measures have borne good fruit in the way of an improved public health is far too evident to require the confirmation afforded by the statistics contained in this paper, and Newcastle of to-day can show a record of sanitary progress of which any city might be proud, and one in which its city fathers and medical officer of health may take no little satisfaction.

W. H. WELLS.

I PURPOSE dealing as briefly as possible with that portion of the paper on "Sanitary Progress in Newcastle-upon-Tyne during the last Twenty-five years," which has been allotted to me, because it can, for the most part, be expressed only statistically.

During the interval embraced by the paper the area of the city has been enlarged by the addition of Benwell, Fenham, and Walker. These districts were previously each governed by an urban district council. Statistics, therefore, are more complicated than if the area of the city had remained the same throughout the whole period under review.

Area and Population.

The area of the city in 1882 was 5,371 acres, and the population about 147,000. This gives a rate of 27 persons to the acre. Just previous to the extension above referred to the population was 225,362, or a rate of 42 persons per acre, including the Town Moor and the Leazes.

Benwell, Fenham, and Walker, with an almost unpopulated portion of Kenton, were added to the city in November, 1904. They contain 3,088 acres. The acreage of the city to-day, therefore, is 8,459, and the total population, including these added areas, was, in 1905, 264,511; rate of persons to the acre, 31.

Rateable Value.

The rateable value in 1882 was £739,754. According to the last assessment it is now £1,640,873, £148,600 of which is due to the added areas. During the last fifteen or perhaps twenty years, an enormous amount of money has been spent by owners of property in some of the principal streets of the city, in pulling down old houses and erecting new and costly buildings in their stead. One such building, the largest, has cost, in the purchase of old houses and the building of the new, over a quarter of a million pounds sterling. In other streets tenemented houses in large numbers have been removed to make room for the erection of business premises, and for railway extensions. Many old houses have been closed as unfit by the sanitary authority. Against this, about 24,300 dwelling-houses have been built during the last twenty-five years, a large proportion of which are in flats, ranging in rent from 4s. to 11s. per week. The Corporation has also erected houses for the working classes to accom-

modate 204 families. For the closure of houses unfit, this authority does not proceed under the Housing of the Working-classes Act, which is cumbersome and often abortive, as two men, as magistrates, may stultify the action of seventy-six as councillors, a power which has been frequently exercised. The power now used by the Council is one obtained in a Local Act, and which enables the authority to close houses which are unfit, on the certificates of the Medical Officer of Health, and without the necessity of having recourse to the Court of Summary Jurisdiction, except for the infliction of penalties when their closing order is not complied with, the magistrates having no power to go behind that order.

In 1885 there were 138 miles of streets. Now there are 233, including the added areas.

At the commencement of the period under review, all the streets (excluding the main roads), excepting a few which are very steep, were paved with granite setts. During the last few years, several of the principal streets have been repaved with wood, and, at present, tar macadam is laid, and is being laid, instead of the setts, in many other streets.

The staff for street scavenging and removal of house refuse consists of 585 men and 77 horses.

43 miles of streets are watered during dry weather, some continuously, some twice, and some three times a day.

SEWERS.

There are 201 miles of sewers, mostly in back streets. To this number must be added 56 miles of drains intended for surface water only. The sewage of Gosforth also passes through the city. The whole of the sewage, both of this city and Gosforth, is discharged into the River Tyne, without treatment.

SANITARY CONVENIENCES.

As to sanitary conveniences, I can only obtain information back to 1887. The numbers in that year, and in 1905, were as follows:—

	1887.	1905.
Water-closets ...	18,055	43,348
Privy-pails	2,362	5,913
Privy-ashpits ...	6,360	960*
Ashtubs	1,047	32,774
Dry ashpits	11,337	2,563

* Ashpits with privies and privy boxes in Walker and Benwell.

These figures shew an enormous decrease in the number of privy-ashpits and an increase in the number of water-closets, also a noticeable increase of privy-pails. These very offensive things were permitted by the authority until a few years ago, in substitution for privies and ashpits removed, but now they are not allowed to be made, water-closets being the only conveniences of the kind sanctioned.

The dry house refuse is removed from every house twice a week, in the daytime; the contents of privy-pails three times a week in the night-time.

The authority has of recent years taken such action in the abolition of privy-ashpits that there are now none left west of the Ouseburn, excepting, perhaps, half-a-dozen which belong to houses in the suburbs having large gardens.

Street Lighting.

Ten years ago there were 5,656 gas and 24 electric lamps; the cost of burning was £14,484, giving an illuminating power of 126,496 candles. To-day we have 8,033 gas and 737 electric lamps, giving an illuminating power of 1,046,370 candles, and costing £28,186 per annum.

It may be interesting to record, as another indication of the growth of the district (including, of course, Gateshead and the other towns in the gas company's area), and of the extended use of gas for power and for domestic use, both having a distinct influence on the smoke nuisance question, that the gas made by the Newcastle & Gateshead Gas Co. was, in 1882, 1,143,048,000 c. ft., and in 1905 3,254,383,000 c. ft., an increase of 2,111,335,000, or 184¾ per cent. The number of gas cookers in the company's area in 1882 was about 300; on the 31st December, 1905, there were 43,256 lent on hire by the company, and about 1,500 owned by consumers, making a total of 44,756. Of gas fires, 1,917 were supplied by the company up to the end of 1905, and probably a much larger number was in use supplied by the local plumbers and ironmongers. The number of gas engines in use in 1882 was probably 200; in 1905 it was 685. When to this large number is added that of engines whose motive power is electricity, the number of which is not known to the writer, it will be seen that the amount of smoke made must have been considerably lessened.

Trams.

In 1882 the tram lines of the city were being worked by a company, to whom they were leased by the Corporation, the company using horses for traction. In April, 1901, the lease terminated. The local authority

laid down new lines and provided an electric tram system, which was opened in December, 1901. There are now $52\frac{1}{2}$ miles of line, and 105 cars running on ordinary weekdays, and 145 on Saturdays. The cost of the system was about £1,154,099.

PARKS AND OPEN SPACES.

The area of public parks and grounds remains nearly the same as in 1882. The Nun's Moor Park has been formed since that date, but upon ground which was previously public. The Cruddas Recreation Ground, four acres, has been added. The parks and recreation grounds of the added areas cover 28 acres. The total acreage now, including the Town Moor and Castle Leazes, is 1,284 acres (3 roods 18 poles), that of cemeteries and churchyards, 104 acres, of private grounds and open spaces, 37 acres, making a total, with the odd roods and poles, of 1,427 acres, 1 rood, 33 poles.

BATHS AND WASHHOUSES.

In 1882 there were three sets of baths in the city, owned by the Corporation, but leased to private individuals, the Northumberland, Gallowgate, and City Road baths. These have since been taken over and worked by the Authority. In 1884 the new baths at Elswick, Byker, and Westgate, were opened to the public, and in that year the total numbers of bathers were: private baths, 81,347; Turkish, 7,125; swimming, 85,696. The numbers of bathers last year were: private baths, 90,302; Turkish, 4,746; swimming, 162,636. In addition to this, about 121,000 persons used the washhouses. Last year the Education Committee made arrangements with the Baths Committee to admit scholars from the elementary schools free of charge during school hours, the scholars to be taught the art of swimming. As a result of this agreement, last summer 32,233 boys, and 7,077 girls were admitted to the baths.

ADULTERATION ACTS.

In 1882 the number of samples of food and drugs submitted for analysis was 102; in 1905, 597 samples were purchased for this purpose. The somewhat large number of samples we submit for analysis is taken with the minimum expenditure of time and money. All (save milk) are purchased informally, and with the aid of hired help. Thus the long time required for division, etc., is saved, the quantity purchased is only one third of that which would be required if the sample were divided, and, better than all, no retailer is aware that he is selling to an inspector for analysis.

Health Department Staff.

In 1882 the staff consisted of the medical officer of health, a chief inspector of nuisances, four assistant inspectors, a chief inspector of provisions and one assistant, and two clerks, ten in all. To-day its composition is: medical officer of health, assistant medical officer of health, chief inspector of nuisances, assistant chief inspector, nineteen assistant inspectors, one chief inspector of provisions and two assistants, six health visitors, a superintendent of midwives, and six clerks, thirty-nine in all, besides the staffs of the hospitals.

Common Lodging Houses.

In 1892 the inspection of common lodging houses, which had until then been in the hands of the police, was placed with the health department. At that time the greater number of these houses were old dilapidated places in slum districts. By constant effort, almost unsupported by help from the law, nearly the whole of these, certainly the worst of them, have ceased to be used as common lodging houses. Great care has been exercised that other houses proposed for registration were suitable for the purpose. The double beds, with which all the houses were fitted up, have been removed, and single beds provided instead.

Drains of New Houses.

The inspection of drains, soil-pipes, etc., of new houses has been given to the Health Department, three officers being appointed for that work. This is a good arrangement, because, by it, the sanitary inspector, who is afterwards, in a sense, responsible for the maintenance of good drainage of houses, has an opportunity of making sure that they are right at the start.

Workshops, etc.

Since 1901, two officers of the staff have been set apart for the examination of workshops, &c. At the present moment we have upon our register:—886 workshops, 104 domestic workshops, 92 workplaces, 58 laundries, 104 bakehouses, a total of 1,244.

This record of the sanitary progress of Newcastle is not, of course, fully comprehensive, but curtailed as much as possible in order to lessen the monotony of figures, yet presents such a view as may convey a general impression of the truth.

COUNCILLOR R. FLOWERS (Newcastle-on-Tyne) emphasised the necessity of providing for the poor people opportunities for getting light and pure air. The sanitary authority had applied themselves to the erection of houses for the labouring classes, with rooms light and airy, and with well-ventilated conveniences. At no distant date, a garden city would be springing up on the Walker estate. He had never heard anybody grumble at the amount of money spent in preventing the spread of disease and in seeking to guard the health of the people.

COUNCILLOR DR. TIPLADY (Newcastle-on-Tyne) said the progress during the past twenty-five years had been great, but the future had in store still greater elements of success for Newcastle. He complimented Dr. Armstrong and the health visitors very highly. They had done much. He knew that the health visitors were doing a grand work, and the results would be great in future years. The death-rate was decreasing, and soon they hoped for greater improvement, and that in the near future there might be more control of disease, and twenty years or more added to the average human life. The infantile mortality was also decreasing, but it was still far too high. Here, too, they had great hopes, for educational processes were at work which must result in improvement all along the line. The housing question was an urgent one, and they needed to build for the poor with small incomes. The houses so built should be built for the present generation, not to last for ages.

DR. H. E. ARMSTRONG (Newcastle-on-Tyne) said the Corporation of Newcastle had done a great deal in recent years to improve tenemented property, and there were now very few of the old slums that he knew in his young days. At present the rents required from the poorer classes of people were very much above what they could afford. Building regulations, which would give more space and less thickness of walls, so that rents should not be increased by unnecessary brickwork, were wanted, he urged.

EXPERIMENTS

MADE TO DETERMINE THE CONDITIONS UNDER WHICH "SPECIFIC" BACTERIA DERIVED FROM SEWAGE MAY BE PRESENT IN THE AIR OF VENTILATING PIPES, DRAINS, INSPECTION CHAMBERS, AND SEWERS.

By Major W. H. HORROCKS, M.D., D.Sc., R.A.M.C. (FELLOW).

Summary of a paper read before the Royal Society on February 7th, 1907.

MOST sanitarians at the present time believe that when sewage is in a putrefactive condition and gas bubbles rising through it are bursting at the surface, bacteria may be carried into the air of drains and sewers. It is also considered possible that when sewage has dried on the surfaces of pipes, bacteria may be separated as dried particles and carried some distance by currents of air passing through the pipes.

The following experiments were designed to ascertain whether there are any scientific facts on which to base these beliefs, and may be arranged in three groups.

GROUP 1.—*Experiments to determine whether Specific Bacteria are ejected into the Air by the bursting of Bubbles at the Surface of Sewage.*

In the first set of experiments, sewage obtained from a main sewer in Gibraltar was inoculated with a rich emulsion of *B. prodigiosus* and then poured into a deep glass jar, so as to form a layer at the bottom about 2 inches deep. At a height of 4 inches from the surface of the sewage two Petri dishes containing nutrose-agar were fastened, the medium facing upwards, to wire tripods, which were then firmly wedged in the bottom of the dish. A glass cover was then put on the dish and the fluid gently shaken by a horizontal movement, until a layer of bubbles formed on the surface of the sewage. This procedure was followed at intervals for three days, the plates were then taken out and incubated at 22° C. After seven days' incubation no signs of the *B. prodigiosus* appeared. Only one colony composed of cocci derived from the air was seen. The experiment was repeated again and again, but invariably with negative results.

The sewage was next inoculated with a rich emulsion of *B. typhosus*, and litmus-lactose-nutrose-agar plates were fastened to the tripods. The dish was shaken as before, the plates were then removed, and incubated at 37° C. No signs of *B. typhosus* or *B. coli* were observed after incubation for one week. Old sewage, smelling strongly of sulphurretted hydrogen gas, was then placed in the dish and the experiments were repeated as before. It was thought that gas bubbles would form more readily in old than in fresh sewage; this proved to be the case, but the special organisms added to the sewage never appeared in the plates.

Soapy water from a lavatory basin was then inoculated with *B. prodigiosus* and freely shaken in a glass bottle until it was permeated with

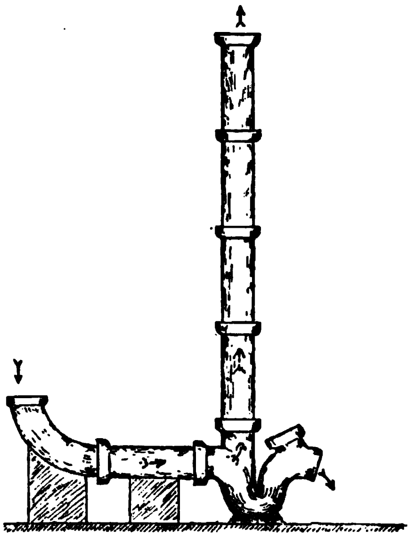

Fig. 1.

bubbles; the fluid was then transferred to the glass dish, the plates, fastened to tripods, were rapidly placed *in situ*, and the cover put on. Twenty-four hours elapsed before all the bubbles dispersed, the plates were then taken out and incubated as before, but no signs of the *B. prodigiosus* appeared.

In the above experiments there were no air currents circulating above the sewage, and the bacteria could only be ejected by the bursting of bubbles. The results appear to show that, independently of air currents, bacteria will not be ejected to a height of 4 inches by the bursting of infected bubbles.

The next series of experiments were made with the apparatus shown in fig. 1. Plates of nutrose-agar were suspended by means of wire cages in the vertical pipe, the uppermost plate being 9 feet above the water in the trap. Soapy water, inoculated with an emulsion of *B. prodigiosus*, was shaken up in a glass-stoppered bottle until the whole fluid was permeated with bubbles, the contents of the bottle were then poured into the trap until it was filled. Under these conditions currents of air passing up the vertical pipe were able to carry bacteria separated from the fluid by the bursting of bubbles. The plates were removed at the end of two hours and incubated at 22° C. The result was that colonies of *B. prodigiosus* appeared in every plate at the end of 72 hours.

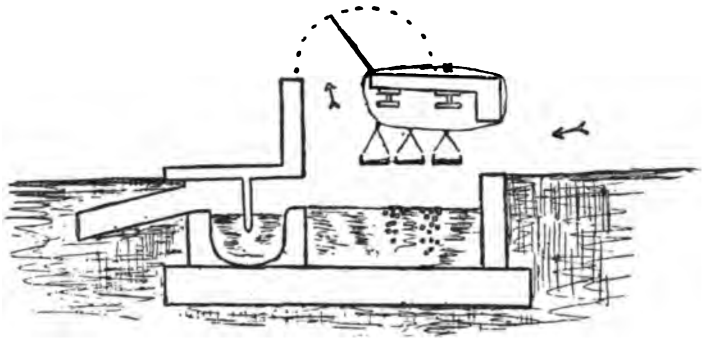

Fig. 2.

The last experiment of this series was made with a catch-pit on the storm-water system of the town. Complaints having been made of foul odours arising from the pit, the hinged cover was thrown back, and it was then seen that bubbles were rising through the water retained in the pit as a result of fermentation processes going on in the mud at the bottom. The pit contained 180 gallons of surface water at the time. An emulsion of *B. prodigiosus* was poured into the water, and plates of nutrose-agar were then suspended as shown in fig. 2. Twenty-four hours later the plates were removed and incubated at 22° C. for two days, when numerous colonies of *B. prodigiosus* were found in all the plates. Control plates of nutrose-agar, exposed to the air outside the pit, did not show any signs of the special organism used in the experiment.

These results show that bubbles rising through stagnant water may eject bacteria, which will be carried away by currents of air passing over the surface of the fluid.

Group 2.—*Experiments to determine whether Bacteria dried on the surfaces of Pipes are likely to be separated and carried by Currents of Air passing through the System.*

The apparatus shown in fig. 3 was employed. Three 2-ft. lengths of 6-in. piping were laid on the ground, and a rich emulsion of *B. prodigiosus* was poured inside each of them. The pipes were then rolled backwards and forwards until the fluid was uniformly diffused over the inner surface of each pipe. Twenty-four hours later the pipes, being perfectly dry, were fitted together with clay joints so as to form the vertical pipe of fig. 3. Nutrose-agar plates were then suspended in the pipe, and sewage

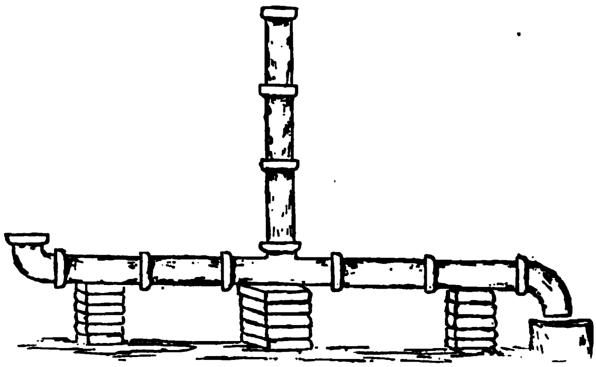

Fig. 3.

was allowed to flow through the horizontal piping at a rate not exceeding 3 feet per second for 20 minutes. The plates were then removed and incubated at 22° C.

At the end of 72 hours, all the plates were found studded with colonies of *B. prodigiosus*. The experiment was repeated several times, and on each occasion the same result was obtained. As the sewage passing through the horizontal pipes did not contain *B. prodigiosus*, and control plates exposed to the air were also free from this organism, it is fair to assume that the currents of air produced by the passage of sewage through the horizontal pipes carried up dried particles of *B. prodigiosus* detached from the walls of the vertical pipe.

GROUP 3.—*Experiments to determine whether Specific Bacteria are ejected into the Air of Drains, Sewers, etc., from Sewage flowing under Normal Conditions.*

In the first series of experiments, the trap of a 6-in. disconnecting trap was filled with sewage, and two lengths of 6-in. drain piping, having a junction bend turned upward, fixed at one end, were fitted horizontally into the house side of the trap. Similar lengths of drain piping, but with the junction bend turned downwards, were also fitted to the sewer side of the trap. The vertical portion above the trap was lengthened by the addition of three 2-ft. lengths of 6-in. drain piping. The apparatus is shown in fig. 4.

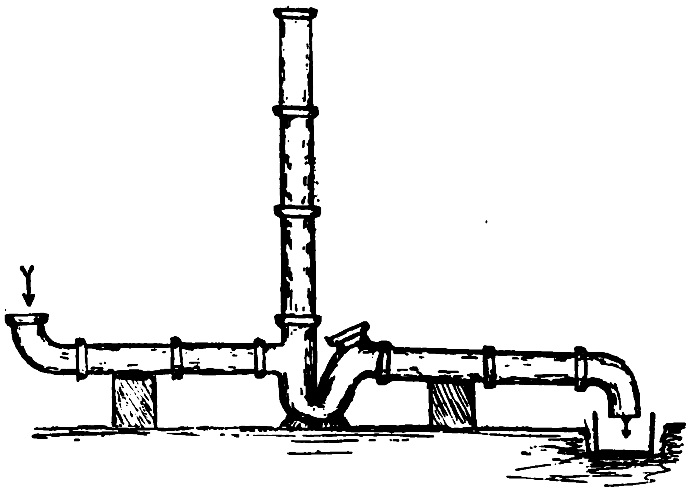

Fig. 4.

Three litmus-lactose-nutrose-agar plates were next suspended with the media facing upwards in the vertical pipe by means of wire cages, the uppermost plate being about 6 ft. 9 in. above the sewage in the trap. Three gallons of sewage, taken from a main sewer in Gibraltar, were then inoculated with a rich emulsion of the *B. typhosus*, and poured down the bend on the house side of the trap. The sewage passed through the apparatus at a rate not exceeding 3 feet per second, and was received in a bucket placed under the bend on the sewer side of the trap. The inoculated sewage was passed through the trap in the same manner on two successive days for about half an hour. The plates were then removed and incubated at 37° C. for 24 hours, when numerous trans-

parent blue colonies resembling those of the *B. typhosus* were seen in each plate. Several of the colonies were tested with anti-typhoid serum (horse), diluted 1–100, and, agglutination occurring at once, the colonies were planted out on agar slopes. The growths thus obtained were examined as to morphology and Gram staining, and then planted out in the usual media. The following results were obtained:—

Medium.	Result of Incubation at 37° C.
Glucose peptone	Acid, no gas.
Lactose peptone	Unchanged.
Maltose peptone	Acid, no gas.
Cane-sugar peptone	Unchanged.
Starch peptone	Unchanged.
Neutral red	Unchanged.
Litmus milk	Very faint acidity, no clotting.
Peptone water	No nitroso-indol reaction.
Potato	Colourless growth.
Proskauer and Capaldi, No. 1	No growth.
Gelatine	Thin transparent growth, medium not liquefied.
Nitrate broth	Reduced to NO_2.
Morphology, etc.	Small motile bacillus.
Gram staining	Decolorised.

The bacilli were agglutinated by an anti-typhoid horse serum diluted 1–500.

A portion of the agar growth derived from one colony was then emulsified in water and injected subcutaneously into a guinea-pig. As a control, a similar emulsion of the *B. typhosus* used to inoculate sewage was injected into a second guinea-pig of approximately the same weight. At the end of three weeks the sera of both guinea-pigs agglutinated, in a dilution of 1–100, the stock culture of *B. typhosus*.

It is plain that in this experiment the *B. typhosus* was ejected from the sewage to a height of 6 ft. 9 in.

Further experiments on the same lines were then carried out with the *B. prodigiosus*, an agar growth emulsified in water being added to the sewage. The same apparatus was used as in the previous experiments, the vertical pipe being gradually lengthened by the addition of 2-ft. lengths of 6-inch piping. The *B. prodigiosus* was recovered from the plates suspended 8 ft. 9 in. and 11 ft. 9 in. above the sewage in the trap.

It was thought that possibly the resistance produced by the passage of the sewage through the trap might have caused the projection of the special bacteria employed into the air contained in the vertical pipe.

Accordingly, in the next series of experiments, the trap was removed and the apparatus fitted up, as shown in fig. 3. Plates of nutrose-agar

were suspended in the vertical pipe, and the sewage mixed with *B. prodigiosus* was made to flow at a rate not exceeding 3 ft. per second, through the horizontal pipes, which were never more than half filled with the sewage. The special organism was again recovered from plates suspended 11 ft. 9 in. above the sewage in the trap.

As in all the above experiments, a very rich emulsion of the special organism, such as would never be found under natural conditions, was added to the sewage, it was determined to repeat the experiments, employing only 1 c.c. of the emulsion, representing one-ninth of the growth on an agar slope after 48 hours' incubation at 22° C., to inoculate the sewage. The same results were obtained as when the rich emulsion was used.

It is evident from these experiments that special bacteria can be ejected from flowing sewage independently of the resistance offered to the flow by the disconnecting trap. But as the plates were left in the vertical pipe for more than 24 hours, it is possible that the colonies in the plates might have been derived from particles dried on the surfaces of the pipes. In order to exclude this source of the bacteria, the experiments were repeated again, but the plates were withdrawn immediately the sewage had ceased to flow, each experiment only occupying 20 minutes. As before, colonies of *B. prodigiosus* were found in all the plates, showing that they must have been produced independently of dried particles carried by currents of air. As there were very few bubbles visible to the naked eye in the flowing sewage, it is not very probable that all the microbes found in the plates were ejected into the air by the bursting of bubbles. I think it is possible that many of the colonies were caused by the ejection of minute infected droplets from the flowing sewage. Gross splashing is out of the question, as the sewage was flowing at a comparatively slow rate, and plates were found infected at a height of 11 ft. 9 in. above the surface of the fluid.

The next series of experiments were undertaken to test the value of the disconnecting trap as a means of protecting a house drainage system from specific bacteria present in the air of the sewer into which the house drain discharges.

The apparatus employed is shown in fig. 5. It was a combination of the arrangements used in the experiments already described. The straight run of piping, with the vertical pipe attached to it, represents the sewer and an attached ventilating pipe; joining the sewer is the house drain, the air in which is separated from that in the sewer by the usual disconnecting trap. The vertical pipe above the trap represents the air inlet or outlet, as the case may be, of the house drainage system. Plates of

nutrose-agar were suspended in both vertical pipes. Sewage inoculated with *B. prodigiosus* was then allowed to flow at a rate not exceeding 3 feet per second through the pipes representing the sewer. The flow of sewage was continued for half an hour on two successive days; the plates were then withdrawn and incubated at 22° C. Colonies of *B. prodigiosus* were found in the plates placed in the ventilating pipe of the sewer, but none were present in the plates placed in the ventilating pipe above the disconnecting trap.

The experiment was repeated again, but during the flow of the infected sewage through the sewer, the disconnecting trap of the house system was repeatedly flushed with 3 gallons of sewage. It was thought that during the flushing of the trap, microbes in the sewer air might possibly enter the house drainage system. This never occurred, the plates on the house side of the disconnecting trap never showed any colonies of *B. prodigiosus*.

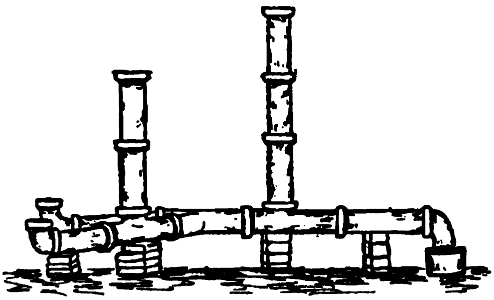

Fig. 5.

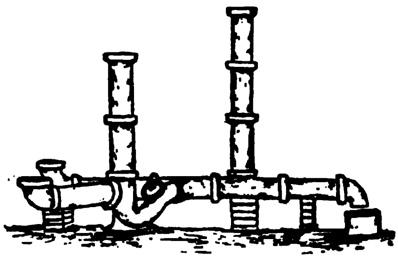

Fig. 6.

The disconnecting trap was then removed, and the apparatus arranged as shown in fig. 6.

Inoculated sewage was made to flow through the sewer as before, and every five minutes a 3-gallon flush was passed through the house drain. Under these conditions, colonies of *B. prodigiosus* appeared in the ventilating pipe of the house system as well as in that of the sewer. These results show that a disconnecting trap prevents microbes present in the sewer air from passing into the house drainage system.

The next series of experiments were made with actual drainage systems.

In the first experiment, a newly laid system of a house in the town was tested by suspending plates in the junction and disconnecting chambers. A plate was also fastened in front of the air inlet of the system, the air inlet being provided with a mica valve. An emulsion of *B. prodi-*

giosus was placed in the pan of the w.c. of the house, which was then flushed out. The plates were removed 24 hours later and incubated, with the result that colonies of *B. prodigiosus* were found in every plate. "Air" plates exposed showed no signs of the special organism used in the experiment.

The second experiment was made at the military hospital, plates being suspended in the top of a 6-inch ventilating pipe connected with a w.c. in the basement. The plates were 50 feet above the ground level. A rich emulsion of *B. prodigiosus* was placed in the pan of the w.c., and the contents were then flushed in the usual manner. At the end of 24 hours the plates were removed and incubated for 48 hours, when all the plates were found studded with colonies of the special organism.

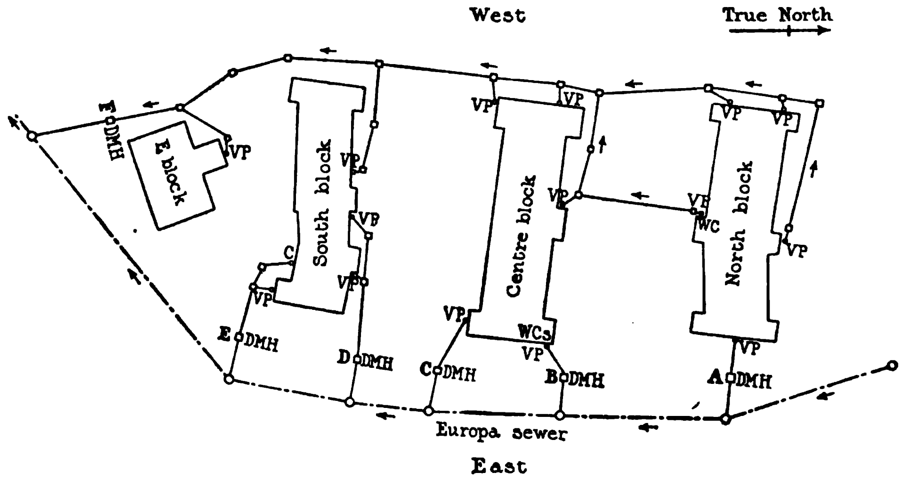

Fig. 7.—Plan of Military Hospital Drainage.

The third experiment was made in connection with the drainage at the east end of the Centre Block of the military hospital. At the north-east corner of the block there is a ventilating soil-pipe, 6 inches in diameter, receiving the contents of a row of w.c.'s placed in an annexe on the first floor of the hospital. The soil-pipe is connected by a 6-inch drain to a disconnecting chamber (B), which is 10 feet deep, and discharges its contents by a short drain into a 9-inch sewer, running along the Europa Road. At the south-east corner of the block there is a similar disconnecting chamber (C), which receives the drainage from a w.c. in the basement, and is also connected to the Europa sewer. There are six inspection chambers, with ventilating covers at the road level, and a 6-inch ventilating pipe on the Europa sewer, between the Centre Block and the

Europa Pass Barracks, a distance of some 200 yards (see plan of hospital drainage). Plates were suspended in the top of the hospital soil-pipe, at the north-eastern corner, some 30 feet above the junctions of the w.c.'s, in the disconnecting chambers A, B, and C, in all the inspection chambers connected with the Europa sewer and in the top of the ventilating pipe of the sewer. A rich emulsion of *B. prodigiosus* was then placed in each of the pans of the w.c.'s, which were then flushed. Twenty-four hours later the plates were removed and incubated at 22° C. After 48 hours, all the plates, except those in disconnecting chamber A, were found studded with colonies of the special organism employed. Plates exposed on the ground close to the centre block for 24 hours were also incubated, but no signs of the *B. prodigiosus* appeared in them.

Judging by the results obtained with the experimental installations, it was expected that the special organism would be found in the hospital soil pipe, disconnecting chamber B, and in the chambers and ventilating pipe of the sewer. But as the disconnecting chamber C, at the south-eastern corner of the centre block, is not in any way connected with the w.c.'s receiving the emulsion of *B. prodigiosus*, and is separated from the Europa sewer by a modern disconnecting trap, the special organism should not have appeared in this chamber. The experiment was repeated again three times, and, in addition to the plates already mentioned, plates were also suspended in the disconnecting chambers D and E connected to the east side of the south block. The plates were left *in situ* for 24 hours, and then incubated as before. Colonies of *B. prodigiosus* appeared in the same places as in the previous experiment, but none were found in the chambers D and E.

It was then evident that there must be some means by which the disconnecting chamber C was placed in communication with the Europa sewer. A careful examination of the bottom of the chamber was made, and it was found that there was no plug in the cleaning arm of the disconnecting trap; consequently the chamber was in direct communication with the air in the sewer. Plugs were fouud firmly fixed in the cleaning arms of the disconnecting traps in the chambers D and E, and prevented micro-organisms in the sewer air from entering the chambers.

The cleaning arm in the chamber C was then firmly plugged and the experiment repeated. The result was that colonies of *B. prodigiosus* appeared in the plates of the hospital soil-pipe and in the chamber B, but none appeared in the plates suspended in chamber C, proving conclusively that the patent cleaning arm had been the channel through which the *B. prodigiosus* entered this chamber in the previous experiments.

As a control of the above experiments, plates were next placed in the inspection chambers connected with the west end of centre and south Blocks. The contents of these chambers are removed by a separate drain, which passes along the west of the hospital into the disconnecting chamber F, close to the south gate of the hospital. No colonies of *B. prodigiosus* were found in any of the chambers, although the plates were treated precisely as in the previous experiments. A fortnight later the experiment was repeated, but on this occasion the pan of a w.c. connected with the drain on the west side of the hospital was inoculated with *B. prodigiosus*, and the w.c.'s on the east side were left in their natural condition. The result was that colonies of the special organism appeared in the plates placed on the west of the hospital, but none were found on the east side.

In all the above experiments the plates were left in the chambers and soil pipes for 24 hours, consequently the *B. prodigiosus* might have resulted from dried particles of the growth separated from the walls of the pipes and chambers and carried upwards by air currents, as well as from the bursting of bubbles and the ejection of droplets from the flowing sewage. In order to determine whether the separation of dried particles was the source from which the bacteria were obtained, the experiments were repeated, but on these occasions the plates were withdrawn as soon as the w.c.'s had been flushed, each experiment only taking 20 minutes. When incubated, the plates showed practically as many colonies of the *B. prodigiosus* as in the previous experiments, showing that special bacteria may appear in the air of the chambers and pipes independently of the separation of dried particles.

It might be objected that in the experiments just related the bacteria were suspended in water and had no organic matter adhering to them such as would be the case under natural conditions. When fæcal material is flushed down w.c.'s and carried through a drainage system, it is probable that the *B. coli* and the *B. typhosus*, in the case of typhoid stools, will have an organic envelope which may materially affect the results.

In order to ascertain whether the objection raised had any force, plates of litmus-lactose-nutrose-agar were suspended in the ventilating pipe of the centre block for 24 hours and then incubated. All colonies having a reddish tint were fished and carefully studied, the result being that typical members of the coli group were readily isolated. Plates were also suspended in large inspection chambers connected with one of the main sewers of the town, about 10 ft. above the flowing sewage. The plates were removed at the end of four hours and incubated, when typical members of the coli

group were again readily isolated. As a final test, the possibility of the *B. typhosus* being ejected from typhoid stools was ascertained by using the apparatus shown in Fig. 8. The trap was filled with sewage, and litmus-lactose-nutrose-agar plates, the media facing upwards, were suspended in the vertical pipe, which was afterwards covered with a glass plate. A typical stool, obtained from a case of enteric fever under treatment in the military hospital, was then mixed with two gallons of water placed in the can connected by indiarubber piping, 1·5 in. in diameter, with the house side of the trap. The taps were next opened, and the contents of the can having passed slowly through the trap, were collected in the can connected to the P outgo of the trap. The taps were then turned off and, the cans having been changed, the infected sewage was again passed through the

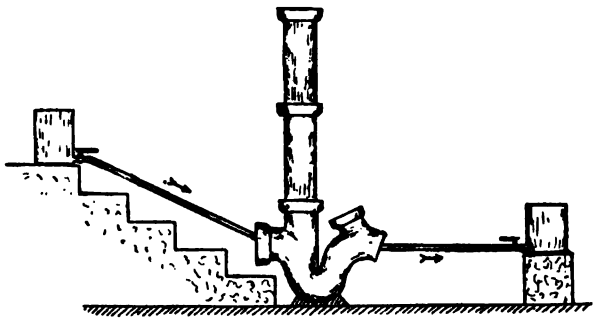

Fig. 8.

trap. This procedure was followed until the sewage had passed 12 times through the trap. The plates were then removed and incubated. Next day several transparent blue colonies were observed; these were fished and planted on agar slopes. The growths resulting were tested with an anti-typhoid horse serum, and one was found to be completely agglutinated by the serum diluted 1—500. The growth was then submitted to the usual tests (see pp. 176–7), which showed that under the conditions mentioned a true *B. typhosus* had been carried up the vertical pipe.

Two days later the experiment was repeated with another stool from the same patient, with the result that three colonies of *B. typhosus* were isolated, one being in a plate of 2 feet above the trap, and the other two in a plate 3 feet 6 inches above the trap.

The experiments were so conducted that no splashing could possibly occur, and on looking through the glass plate on the top of the vertical pipe, when sewage was flowing through the trap, a few bubbles were seen

bursting at the surface of the fluid. The pipes and trap employed were new, and had not been used in any of the previous experiments.

These results show that bacteria existing in sewage under natural conditions can be ejected into the air in the same manner as the naked bacteria used in the experiments already recorded.

Conclusions.

The experiments show that:—

1. Specific bacteria present in sewage may be ejected into the air of ventilation pipes, inspection chambers, drains, and sewers by (*a*) the bursting of bubbles at the surface of the sewage, (*b*) the separation of dried particles from the walls of pipes, chambers, and sewers, and probably by (*c*) the ejection of minute droplets from flowing sewage.

2. A disconnecting trap undoubtedly prevents the passage of bacteria, present in the air of a sewer, into the house drainage system.

3. An air inlet, even when provided with a mica valve, may be a source of danger when it is placed at or about the ground level.

HIGHWAY MAINTENANCE & REPAIR.

DESCRIPTIVE SPECIFICATION OF A SYSTEM OF REPAIRING & RESURFACING EXISTING ROADS, DEVISED

By A. GLADWELL.

Engineer and Surveyor to the Eton Rural District Council.

FOREWORD.

THE question as to how best to meet the demands of the enormously increased and increasing traffic to which the public highways of the country are being and will be subjected, is one which has been engaging for some time the attention of all who are interested in the great road problem. Many suggestions have been made, having for their object the improvement of the condition of our public highways.

This descriptive specification has been prepared in the hope that it may induce other road engineers and surveyors, and, indeed, anybody and everybody interested in the subject, to test the value or otherwise of the idea. The author, however, hopes that those who do make a trial of the system will keep such data (of cost of laying, comparative dustlessness and durability, etc.) as will serve to indicate whether the system is or is not an improvement on existing methods of construction, and will from time to time communicate such data to him in order that it may be tabulated, and in due time published for the information of all interested.

DESCRIPTIVE SPECIFICATION.

1. If the road about to be surfaced is an old road, make up all depressions or puddle holes therein, and generally strengthen the foundation with the best available material, so as to bring the old surface up to a reasonably correct contour.

If a new road is about to be surfaced, the above precaution will be unnecessary, as the foundation will have been properly prepared.

Matrix.

2. Obtain or make a matrix or flux of tarred slag or macadam, made with screenings about $\frac{1}{4}''$ to $\frac{3}{8}''$ gauge (if not obtained from any of the firms who manufacture this kind of material), which should contain such proportions of distilled tar, pitch, resin, lime, or cement as practice or experience may dictate as the best, and spread this matrix or flux evenly and to a thickness of about three quarters of an inch over the old surface. No scarifying or tarring of the old surface is necessary.

Aggregate.

3. On the matrix or flux spread a coating of granite or such other good road material as experience has proved to be suitable to the traffic of the district in which the road is situate; this coating should be about two stones in thickness, broken to as square a section as possible, and not less than 2″ gauge; all flaky or indifferently broken material should be rejected, and care should be taken to keep the aggregate clean and free from foreign matter, so that it may form an amalgam with the matrix. In districts where granite is not available, other materials, such as limestone, flints, etc., might be used, but experience will prove that the use of the best materials will tend to ultimate economy.

4. Immediately roll the granite or other aggregate down into the matrix with a ten- or twelve-ton steam roller, taking care that the pace of the roller is retarded during the first two or three journeys over the new surface; afterwards it will be found that the new work will stand any amount of rolling without in any way punishing the material.

Keep on rolling until the matrix or flux appears in the interstices of the granite surface; if an excess quantity of matrix material has been used this will appear on the surface too soon. It will be found that if the matrix begins to appear after the roller has been over the surface *fifteen* to *twenty* times the proportion of matrix to aggregate is about right; it is important to remember that the best results will be obtained by using the minimum quantity of matrix necessary to consolidate and hold the aggregate in position.

No watering-carts or sweepers will be necessary; the cost of those will be a set-off against extra cost of tarred or bituminous matrix material over sand, hoggin, or chippings.

Do not put a single ounce of sand or dust into the structure of the road or on its surface.

If the matrix works up to the surface before the rolling is completed,

and exhibits a tendency to adhere to the roller wheels, lightly sprinkle the latter with water from an ordinary watering-can.

GENERALLY.

In the foregoing the operation of resurfacing a road to a thickness of about 3" has been described; if it is required only that a road should be treated with a thin coating of new material, the operation under this system will be precisely similar to that already described, so long as the due proportion of aggregate to matrix is observed.

The same may be said if only slight repairs to existing road surfaces were undertaken, with this difference that the old road surface at the edges only of all new patches would require to be picked up to form a key.

The author believes that it will cost no more to resurface a section of road under his system than under the old system of binding with sand, chippings, etc., while the life of the road will be considerably increased.

If no binding sand, road scrapings, or other material of like character is introduced into the structure of the road, it follows that no mud will exude therefrom, thus considerably minimising the cost of scavenging or cleaning.

The author is now engaged in experiments having for their object the production of a bituminous freely-flowing flux, to be used for *sealing the surface* of the road in cases where it may be considered advisable to supplement the lower layer of matrix by brushing in on the surface of the road a mixture which will absolutely seal the surface against moisture; the results of these experiments will be communicated later on.

NOTES ON LEGISLATION AND LAW CASES.

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For full text of these see Law Reports, which can be referred to in the Library of the Institute.

WATERWORKS.—*Injurious affection of land—Loss of support—Authorised working—Construction as distinguished from user of works—Compensation—Construction of statutes—Waterworks Clauses Act, 1847 (10 & 11 Vict. c. 17), ss. 6, 12.*

Sects. 6 and 12 of the Waterworks Clauses Act, 1847, are, notwithstanding the heading of the group of sections to which they belong, to be construed as providing for compensation to landowners in respect of the injurious affection of their lands by the taking of water found in and under the lands taken for the construction of waterworks, for the purposes of the waterworks after the completion of the structural works.

General words in the heading of a group of sections cannot be construed as limiting the effect of plain words in a section contained in that group.

So held, affirming judgment of Bray J. (1906) 1 K.B. 605.

Hammersmith & City Ry. Co. v. Brand (1869) L R. 4 H.L. 171 distinguished.

Fletcher v. Birkenhead Corporation, 1 K.B. 205 (1907). (Dec., 1906).

RIVER POLLUTION.—*Summary proceedings by sanitary authority—Consent of Local Government Board—Notice of intention to take proceedings—Validity of notice—Rivers Pollution Prevention Act, 1876 (39 & 40 Vict. c. 75), ss. 4, 5, 13.*

The Rivers Pollution Prevention Act, 1876, authorises a sanitary authority to take proceeding in respect of certain offences under the Act, but provides that such proceedings shall not be taken without the consent of the Local Government Board, nor until the expiration of two months after written notice of the intention to take such proceedings has been given to the offender:—

Held, that the notice could not be given until the consent of the Local Government Board has been obtained.

West Riding of Yorkshire Rivers Board v. Scarr End Mill Co. (1901) 65 J. P. 776, overruled.

Midlothian County Council v. Oakbank Oil Co., Ltd. (1903) 5 F. 700, followed.

West Riding of Yorkshire Rivers Board v. Robinson Brothers. C.A. (1907) W.N. 19; (1907) 1 K.B. 431. (Jan., 1907.)

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THE AIM AND SCOPE OF WOMEN'S WORK IN RELATION TO PUBLIC HEALTH.

By H. MEREDITH RICHARDS, M.D., B.S.,
Medical Officer of Health, Croydon.
(FELLOW.)

Read at Sessional Meeting, London, April 9th, 1907.

THE subject for this discussion being capable of indefinite expansion, some limitation is imperative. In its broadest sense, all kinds of "women's work" can be discussed "in relation to public health," inasmuch as it may influence for good or ill either the health of the individual or the health of the community. Such a general survey would, however, carry us too far afield, and it is therefore proposed to limit our discussion to the assistance which can be rendered by women *in local public health administration;* and to omit reference to such important problems as the relation of home influence to public health, and the effect on the present and future generations of the increase in the number of women who are adopting various trades and professions. Even with these limitations it is impossible to deal exhaustively with the subject in the short time at my disposal. I shall therefore content myself with summarising, as briefly as possible, the general conclusions at which I have arrived after ten years' experience of women's work in public health administration.

In the first place, it seems to be too often forgotten that there are fundamental differences, not only in the training, but in both the physical and mental capabilities of men and women, and that due regard should be paid to these differences in allotting to men and women respectively

their true place in public health work. A firm in the city, which had on its staff a good linguist and an able accountant, would show little common sense if they selected the former as their book-keeper and relegated their foreign correspondence to the man of figures. Similarly, in public health work, men and women have different aptitudes, and we are not making the best of our human material unless we recognise these aptitudes, and assign to each the task which they can do most efficiently and, therefore, with greatest ease to themselves and advantage to the community.

To avoid misconception, it may be well to insist that this is not a question of superiority or inferiority: it is simply a protest against ill-advised attempts to put square pegs into round holes.

In fact, it is just because women can do certain things better than men can that they should be selected for those posts in which their special capabilities can have free play, and it is equally because they do other things less well that they should not be given posts for which they are by nature unsuited.

Let us glance for a moment at one or two of these points of difference. In an essay published many years ago, Buckle pointed out that women's minds are not only more deductive than men's, but quicker of apprehension, and quotes Dr. Currie's statement that when a labourer and his wife came together to consult him, it was always from the woman that he gained the clearest and most precise information. Similarly, in a foreign country it is always better to inquire the way of a woman, as a man will show less readiness of comprehension.

Now, it is just this ready wit and facility of expression that make women specially suitable for what one may call the educational side of public health work, such as the instruction of mothers in the care of their children and in personal hygiene.

On the other hand, women, like men, have the defects of their qualities. Thus, while the ready sympathy of women is immensely useful when dealing with children, it frequently tempts them to take short cuts and to give alms when they should be content with exercising moral pressure and leaving the provision of material relief to other agencies.

Again, it is a matter of common knowledge that women, as a whole, have little taste for mechanics, and are therefore, as a rule, unfitted for undertaking what we may call the sanitary engineering side of public health work. To this conclusion I am led, not only by general observation, but by the result of frequent attendance at the examinations of this Institute. Indeed, were weakness in sanitary engineering not compensated by superiority in other directions, it is unlikely that many women would

succeed in satisfying the examiners. Public health administration, however, is (fortunately for women and, in my opinion, for the country also) year by year less and less a mere matter of "drains."

Though capable of a very large amount of routine work, women are not so fitted as men for meeting sudden demands on their energies. Emergencies will, however, arise, and for this reason among others the amount of holidays allotted to women workers should be as large as possible.

Let us now shortly summarise the duties which can most profitably be discharged by women.

(*a*) Visiting newly-born infants.

(*b*) Visiting the poorer houses and giving practical instruction in personal hygiene.

(*c*) Supervising cases of phthisis.

(*d*) Supervising the practice and inspecting the homes of midwives.

(*e*) Giving popular lectures on personal hygiene and on the management of infants.

(*f*) Inspecting under the Infant Life Protection Act.

(*g*) Management of milk depots.

(*h*) Inspection of workshops where women are employed, and supervision of out-workers.

(*i*) Supervision of houses let in lodgings.

(*k*) Visiting cases of measles, whooping cough, ringworm, etc., reported from the public elementary schools, and securing treatment for these diseases.

(*l*) Visiting schools for the detection of verminous conditions and ringworm.

In reference to the last two items, it is important to remember that compulsory medical inspection of school children is bound to increase very materially the demand for trained women to assist the inspectors. Though the actual medical examination must be done by a qualified medical man or woman, much of the preliminary work can be entrusted to a trained nurse who could, for instance, record the histories of past illnesses, ascertain the height and weight, and generally act as a kind of clinical clerk. Health visitors will also be more than ever necessary in order that subsequent home visits may be paid, medical treatment secured when necessary, and insanitary conditions discovered and remedied.

How women are to be trained for these duties, and how their capacity should be tested, are other problems which immediately suggest themselves, but do not appear to come within the limits of this

discussion. I cannot, however, refrain from expressing the opinion that the opportunities for securing the right kind of training are at present inadequate, and that no examining body demands from its candidates quite the kind of knowledge and training that in my judgment are essential.

So far we have confined our attention to women's sphere in public health administration, but it should not be forgotten that there are numberless other ways in which women can with advantage co-operate in the advancement of public health. For instance, many boroughs have associations or guilds of voluntary health workers who supplement the work of the health department. District visitors could also render valuable aid were they instructed in elementary hygiene, and the public is at length beginning to realise the assistance which school teachers can render in securing the physical as well as the mental betterment of the race.

So much for the "scope" of women's work in relation to public health. The "aim" of women's work hardly suggests any matter for discussion, for we are here on common ground. Both men and women workers are seeking to advance the physical, mental, and moral well-being of the race; and again, to quote Buckle,* "by this coalition, by this union of different faculties, different tastes, and different methods, we shall go on our way with greater ease. A vast and splendid career is before us, which it will take many ages to complete. . . . . . So far, however, from desponding, we ought to be sanguine. We have every reason to believe that when the human mind once steadily combines the whole of its powers, it will be more than a match for the external world. As we surpass our fathers, so will our children surpass us."

Miss M. E. Baker (Gomshall) said that before legislation or inspection could be widely effective, it must be supported by public opinion, or evasion of the law would be frequent, and in creating a healthy public opinion women's work should have a strong educative influence. She urged that principles of health should be simply explained, without needless technicality; and obedience to the laws of health pressed with humility and good reason given, avoiding the dangerous boomerang of exaggeration. She maintained that a foundation was laid, helpful to the work of medical officers, when dressmakers and other employers understood that compliance with public health Acts made better work possible, as well as better health for their employees: and also when people understood the precautions to be taken in cases of infectious disease. Hygiene was not a fussy faddism forbidding freedom of life and solely occupied with drainage. Women

* The Influence of Women on the Progress of Knowledge.

health workers should show her as "a daughter of the gods divinely fair," a daughter of charity, beginning her work at home but enlarging it in ever wider circles, parochial, patriotic, imperial, and international.

MISS FITZGERALD (Woolwich) said she wished to emphasise two points only. One was that the field of the health visitor was practically a unique one; the other was the need in health visiting work to maintain the investigator's attitude along with the enthusiasm for practical reform. When sanitary science ceased to be wholly concerned with environment and began to consider the question of the individual, then came in women's greatest opportunity in public health work. The work of the health visitor lay in the region of the home-life of the people, where personality is the central factor; where the individual was seen, both influenced by environment and helping to create environment. To this field of observation no other trained worker came who saw it in so normal and so manifold an aspect. She contended that this large and almost unexplored field would yield up much valuable knowledge of the personal element in health problems, necessary knowledge of the individual in relation to the home environment if investigated in a genuinely scientific spirit. Therefore, health visitors should definitely aim at being investigators as well as missionaries. The investigator's keenness lying at the back of practical reform work was necessary to keep that work fresh, vigorous, and always in touch with growing knowledge. Another reason for the investigator's attitude was the fact that the practical work was being done upon incomplete knowledge; and the health visitor, while working to-day upon the knowledge that was new yesterday, should be helping to create the knowledge of to-morrow. Everybody would admit that the last word had not been said on the infant mortality problem, nor indeed on any health problem. It would not be given to health visitors to pronounce that last word, but by their investigations in their own sphere of work they might add some quota of knowledge, supplementary to results obtained in other fields of research, which might enable that last word to be said ultimately. The work of the health visitor, having as its sphere the normal home-life of the people, should, in order to attain to the fulness of its possibilities, be made more scientific and be given a definitely sociological character.

DR. G. F. MCCLEARY (Hampstead) reminded the meeting that Dr. Richards, with whose views he was in agreement, had been one of the first medical officers of health to have a health visitor working under him. In the improvement of personal hygiene women had a most important and useful sphere of work, but he did not think that women should necessarily be restricted to that sphere, because in the hygiene of environment women had a special capacity for looking at things which often escaped men. Also they could do work which could not be done by men. He quite agreed with Miss Fitzgerald as to the importance of investigation. In public health matters knowledge in many respects was still very defective, and it was important that that knowledge should be increased.

In the control, investigation and treatment of disease they were now passing from the qualitative into the quantitative stage. They could not expect sanitary measures to be adopted on a basis of mere opinion; they must work on a basis of ascertained facts. This knowledge could only be got by investigation, and he thought every health worker should carry on investigations on their own account. Every piece of specific knowledge was of value, no matter how small it might be. What the world wanted more than anything else was verified, positive knowledge; and every worker, no matter how humble, had a chance of making investigation which would add to our stock of verified knowledge. This made their work much more interesting. He agreed that special training for women workers was necessary, and in personal hygiene much more was required than is now provided. He thought that medical women had a great future before them in public health work, and, in fact, he believed that medical women were beginning to find their true vocation in public health work. It was not necessary to limit them to health visiting, but there were many other lines of public health open to them, such as the supervision of midwives and the work of school hygiene, which latter was only just beginning to be developed. He believed that public health work was soon to take a very great expansion, and women doctors would be found indispensable to our system of public health administration.

Miss Blanche Gardiner (St. Pancras), acting as delegate of the Women Sanitary Inspectors' Association, said that the various branches of their work touched upon by Dr. Meredith Richards showed that the aim of women's work in relation to public health was a high one, and the scope a wide one; and that the women sanitary inspectors and health visitors of her acquaintance tried to do good and original work; work which they hoped might have not only immediate and local results, but far distant and widespread ones. But whenever the nature and results of the work of women sanitary inspectors were discussed (as, for example, at the Infantile Mortality Congress last year, and at Sanitary Congresses, etc.), one could not be blind to the fact that the work was, as a rule, appreciated; and that though it might differ in detail from that of the men sanitary inspectors, yet it was not generally regarded as *inferior* in either quality or quantity. Was there, therefore, any reason why, in almost every case, the salary of the woman sanitary inspector should be less than that of the man sanitary inspector? Could not something be done to improve their position, either by making their salary equal to that of the men inspectors of the same borough, or else (as some of them would prefer) by granting them, as compensation in lieu of equal salary, extra annual holiday; instead of the all-insufficient three weeks granted in London, and two weeks only in the provinces? She was glad to hear Dr. Meredith Richards' opinion that "the amount of holidays allotted to women workers should be as large as possible," and to know that the holidays of his

women sanitary inspectors at Croydon had been increased from a fortnight to a month.

DR. W. A. BOND (Holborn) said that he was generally in agreement with Dr. Meredith Richards' paper, and was very glad to say that his Council appointed a lady sanitary inspector about three and a half years ago. Visiting newly-born infants was, he thought, essentially women's work, although under the existing law relating to the registration of births newly-born was, in very many cases, hardly the correct word, as, on account of the delay in registration, many infants were not visited until two or even three months after birth, and it was therefore very desirable that the law should be altered and earlier registration of births enforced. Instruction in the proper feeding and care of infants was most important in the prevention of infantile illness and mortality, as it was well known that the mortality of hand-fed children was enormously greater than that of breast-fed children. Although Holborn had no milk depot, they had arranged with a large dairy company for the supply of prepared milk for infants, and work in connection with this was very properly carried out by the lady inspector. In Holborn the lady inspector was also engaged in the inspection of outworkers' homes, domestic workshops, workshops where females were employed, laundries, day schools, and kitchens of restaurants, also in assisting in the inspection of tenement houses. The lady inspector was also very usefully engaged in visiting and supervising cases of phthisis, measles, whooping cough, and infantile diarrhœa, and in inquiries respecting causes of death of infants and their relation to improper feeding, etc.

MISS WADMORE (London) spoke strongly in support of the raising of the age at which women were allowed to enter public health work. She complained that young women without a knowledge of the world received appointments, and urged that some practical experience and training should be regarded as essential in any woman holding a public appointment of the kind under review. Experience was valuable, and yet most of the appointments for women health visitors and inspectors were closed at forty. The women inspectors for secondary schools, appointed under the Board of Education, had no such age limit.

MISS CAREY (Westminster) appealed to the lecturer not to judge women by what he saw of them in examinations. It was true that they were generally weak in sanitary engineering, but this was due not necessarily to want of capability or interest, but to lack of proper instruction. There was a tendency to limit the knowledge and opportunities of women inspectors rather than develop their professional activities on broad lines. It was most important that all women inspectors should have a knowledge of drainage and structural work, as it was preposterous that a sanitary inspector should be able to visit a house

and come away without knowing whether that house was structurally sanitary or not.

Mr. A. G. Duck (Woolwich) urged that all drainage and structural works should be left to the male inspectors, and that the female sanitary inspectors should be designated "health visitors," for whom there should be a separate training and examination.

Mr. James Ballantyne (London) said it was not at all surprising that most women candidates, as Dr. Richards had told them, did not shine in their answers to questions about drainage. It would, however, be a mistake to attribute such weakness to any innate inability on the part of women to understand mathematical and mechanical problems. Hitherto the ordinary education for girls had been weak in this direction, and after making due allowance for this some women displayed quite exceptional mechanical aptitudes. In illustration of this, mention might be made of a case in which a woman with no previous special training taught a bungling and incompetent mason how to lay a tile hearth. It might be well to allow options in the sanitary examinations, so that scientific knowledge of child life might be accepted in substitution for building construction; but in the public interest it would be a mistake to deny women facilities for the thorough study of all branches of sanitary science.

The Chairman (Col. J. Lane Notter, R.A.M.C.) summed up the debate, and said he was distinctly against any step which had the effect of lowering the standard of examination for women. Ladies going in for the sanitary inspector's examination were subject to just the same tests in respect of sanitary fittings as men. He sympathised with the complaint as to the inadequate salaries of women inspectors, and said that he did not think the Local Government Board recognised the importance of the part women played in the public health administration of this country. Their duties were laborious, exacting, and exhausting, and those who discharged them deserved more than a living wage. The discussion they had had on the subject was most interesting and instructive, and they were indebted to those ladies who had placed their views so clearly before the meeting.

Prof. H. R. Kenwood (Stoke Newington) sent the following note:—

I am in general agreement with the statement made by my friend, Dr. Meredith Richards, but a few observations on his opening remarks will serve to indicate my own views upon women's work in relation to public health.

I am enthusiastic in my belief of the value of that assistance, and it is now many years since my view was expressed in this building that the time was at hand when no sanitary authority which did not provide such assistance would be considered properly equipped for its duties.

The services of women I value highly because in my experience the serious woman when she undertakes duties performs them well; for she is very keen,

thorough, and conscientious. I value highly her services in public health work because I recognise that there are very important branches of that work (branches which have been sadly neglected in the past) which she can execute far more effectively than the male worker. It is as essential that women should deal with the women in matters almost exclusively affecting the latter (such as the infant, the conditions of female labour in workshops, etc.) as I am that men should deal with the men in such matters as sanitary construction, etc. The allotment of the executive work in the Public Health Department should be broadly on the lines of sex for sex; and I not only endorse Dr. Meredith Richards' view that women can be employed with advantage even in the work upon houses let in lodgings, but would go further and advocate their assistance in connection with the home inquiries which follow upon the notification of infectious disease, for very generally these inquiries relate to children, and are made at a time of the day when it is from the mother (and rarely from the father) that all the information has to be collected.

I heartily agree with Dr. Richards that no present examining body demands quite the kind of knowledge and training that are essential to the woman public health worker, and I think the fault mainly lies in the direction of including non-essential matter to the prejudice of the essential. Has ever any woman been asked to direct and supervise the construction of drains and sewers, to advise upon or manage sewage works, or to deal with slaughter-houses? and yet these items have to be gone into with more or less detail in their training course. This is just as reasonable as it would be to include such items as infant rearing in the training course for the male inspector. My suggestion must not be held to imply that I advocate any curtailment of the course of studies and period of training of women workers; on the other hand I hold that both should be extended, but in the direction of specialising in those branches of work that women are eventually called upon to undertake.

MISS LEWINS, MISS DE CHAUMONT, and MISS CHARLESWORTH also took part in the discussion.

NOTE—*The following papers on this subject have been previously published in the Journal:—*

"The Work of a Health Visitor," by MISS R. E. GARDINER. Vol. XXI.

"Women Health Visitors," an extract from a report by the medical officer of health of Birmingham, DR. A. HILL. Vol. XXIII.

"The Essential Qualifications of a Lady Health Visitor," by MISS E. M. EVANS. Vol. XXIV.

"The Work of Women as Sanitary Inspectors," by MISS A. M. DICK. Vol. XXV.

"The Health Visitor from the County Council Point of View," by PROF. A. BOSTOCK HILL. Vol. XXVII.

"The Work of Women as Sanitary Inspectors and Health Visitors," by MISS K. L. LONG. Vol. XXVII.

ANNUAL MEETING OF ASSOCIATES.

AT the Annual Meeting of Associates the subject brought up for discussion was "The Training of Sanitary Inspectors before taking Office." Dr. Louis Parkes, in introducing the discussion, set out the duties which a sanitary inspector was required to perform, and suggested the kind of training and study required to enable an inspector to carry out these duties. He summed up his suggestions as follows:—

1. That it is not desirable that all candidates for the examinations of The Royal Sanitary Institute or of the Sanitary Inspectors' Examination Board (formed by The Sanitary Institute and other bodies) should be required to have previously held office as sanitary inspectors.

2. That the regulations of The Royal Sanitary Institute and of the conjoint Examination Board are sufficient for the purpose of insuring that the candidates have *some* practical knowledge of the subjects in which they are to be examined, and are all that are possible unless all candidates are to be drawn from a very limited class.

3. That there is great advantage in a candidate for the office of sanitary inspector having had practical experience as a disinfector, testing assistant, and junior clerk in the public health department of some sanitary authority.

4. That whilst it would not be possible to require that sanitary authorities should not appoint anyone as sanitary inspector who had not gained practical knowledge in the manner above suggested, such practical experience ought to count as a good qualification for the post sought.

5. That whilst candidates may acquire a certain amount of knowledge by being permitted to follow the practice of the public health department of a sanitary authority from day to day as students, a really intimate knowledge of the work required cannot be so obtained; and it is unreasonable to expect that sanitary authorities should hamper the work of their public health departments by offering such facilities to students on any extended scale.

Mr. Anderson, the Chairman of Council of the Sanitary Inspectors Association, suggested that a distinction should be drawn between candidates having a knowledge of the subjects of the examination, and those who had practical experience and had proved themselves competent in carrying out the duties of a sanitary inspector; he thought that the examination might be divided so as to indicate these two classes of men, those who had passed a primary examination and were suitable to be

appointed as assistant sanitary inspectors under the guidance of a competent officer, and those that after experience in this capacity undergo a second examination as to their capability in carrying out their full duties, these to receive a second certificate that they were qualified to act as full inspectors. He also suggested that a different examination should be arranged for women inspectors, as it was impossible for women to carry out the whole of an inspector's duties, and he thought they should not receive a certificate that appeared to imply that they were capable of carrying out the whole of an inspector's work.

A letter was read from MR. ISAAC YOUNG, late Chairman of the Sanitary Inspectors Association, also suggesting the desirability of the two examinations before a candidate received his full certificate of competency.

Several other Associates spoke on the points raised, and at the close of the discussion, COL. J. LANE NOTTER, the Chairman of Council, who was presiding, promised that the several points should be brought under the notice of the Council of the Institute, and he was quite sure that they would receive most careful and sympathetic consideration.

LOCAL AUTHORITIES THAT HAVE APPOINTED WOMEN AS INSPECTORS OR HEALTH VISITORS.

List compiled by MISS L. M. O'KELL. (ASSOCIATE.)

Acton. Battersea (2). Beckenham. Bethnal Green. Camberwell. Chelsea. City of London (2). Croydon (2). Edmonton. Finsbury (2). Fulham. Hackney (2). Hammersmith. Hampstead. Holborn. Islington. Kensington (3). Lambeth (2). Lewisham (2). Paddington (2). Poplar. St. Marylebone. St. Pancras (2). Southwark (3). Tottenham (2). Walthamstow. West Ham (3). Westminster (2). Willesden (3). Woolwich.

Aberdeen. Belfast. Birmingham (8). Bootle. Bradford (2). Chatham. Derby. Dublin. Dundee (2). Gateshead. Glasgow (8). Greenock. Lancaster. Leeds (6). Leicester. Leith. Liverpool (8). Longton. Manchester (6). Middlesbrough. Newcastle-upon-Tyne (2). Nottingham. Northampton. Norwich. Oldham (2). Paisley. Plymouth. Preston. Rathmines. Reading. Rochdale. St. Helens (2). Salford. Sheffield (7). Stockport (2). Stockton-on-Tees. Swansea. Wallasey. Warrington. Warwick C.C. (2).

DESCRIPTION OF A SLIDE RULE

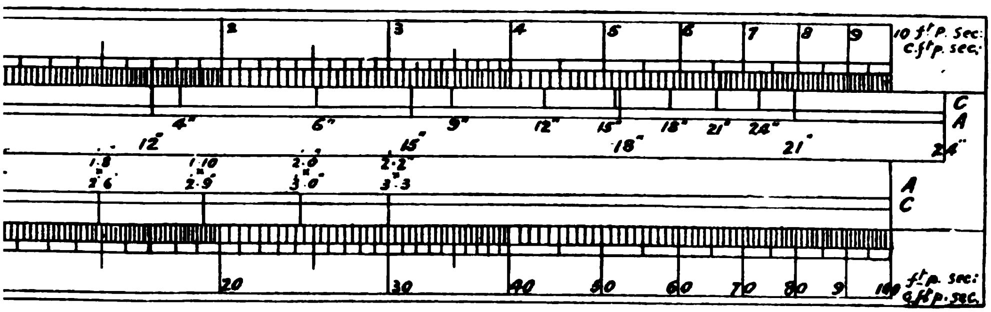
FOR DETERMINING THE VELOCITIES AND DISCHARGES [illegible].

G = 100 are accepted as being correct between the limits of G = 10 and G = 1,000, a slide rule can be constructed which, between these limits, will solve Kutter's formula without any serious error.

4. On the first, or upper, scale of the rule plot a logarithmic scale three bases long, each with a 5″ base (20 scale), commencing with V (and Q) = 0·01 and ending with V (and Q) = 10 ft. per second (and

cubic feet per second). Call the distance from the left of the scale to any given value of V (or Q) the Station of this value. Then, since the scale commences at 0·01, Sta. $V = 2 + \log. V$. If, for example, $V = 2$ ft. per second, then Sta. $V = 2{\cdot}30103$, where the characteristic represents two base lengths of 5 inches and the mantissa is 0·30103 of the base length, so that Sta. V. is 11·50515 inches from the left of the scale.

5. On the third scale of the rule plot a logarithmic scale two bases long, each with a $2\frac{1}{2}''$ base (40 scale), commencing with $G = 10$ and



'ORMULA.

the accompanying sketch, stations C have been calculated with N=0·013 and G=100, and marked by the sizes of the sewers to which they refer, namely, pipe sewers flowing half full.

9. Since $Q = AV$, or $\log. Q = \log. A + \log. V$, it is clear that if a distance equal to log. A is added on to Sta. C (which has been shown to be identical with Sta. V), Sta. A will be given, and Sta. Q will be

directly above Sta. A thus determined. These stations of A, which in the sketch refer to pipe sewers flowing half full, are also called by the sizes of the sewers to which they refer, similarly to the stations of C.

10. By now sliding the rule so that any given gradient on the third scale is directly above the line on the fourth scale, marked Sta. R, the velocities and discharges of all sewers given on the second scale are found directly above these sewers on the first scale. A very small error will be detected when G is taken as 1,000, which will become gradually smaller until the correct result is given as G gets less, and correct results will, of course, be given where G = 100. Between the limits G = 100 and G = 10 the error is too small to be detected on the rule.

The space to the right of G=1,000 on the third and fourth scales may be utilised to give the velocities and discharges of oval sewers of the new egg shape (*i.e.* where the larger radius of the lower half of the sewer is $1\frac{1}{3}$ times the breadth of the sewer. For this purpose, on the fourth scale of the rule shown in the sketch, a logarithmic scale with a 5″ base (20 scale) and 2 bases long has been plotted, commencing 5″ from left of scale with V (and Q) equal to 1, and ending with V (and Q) equal to 100 ft. per second (and 100 cubic ft. per second). With N = 0·013 and G = 1,000, the velocities and discharges of various oval sewers flowing $\frac{2}{3}$-full have been calculated, and $2\frac{1}{2}$″ (the distance between G = 100 and G = 1,000) added to the stations of V and Q. These results have been plotted on the third scale, commencing also at a point 5″ distant from left of scale in a similar manner to that described in pars. 8 and 9. G has been taken as 1,000 in this case, as oval sewers are more frequently used at gradients nearer 1 in 1,000 than 1 in 100.

It will be noticed in the sketch that the lines representing the values of C for the sewers (which give the velocities) are distinguished from the lines representing the areas of the sewers (which give the discharges) by being shorter. If, however, a rule be constructed of cardboard, it will be found better to use different colours to distinguish these lines. A cardboard rule can easily be made, and will be sufficiently accurate for all practical results. The following tables may be useful in constructing a rule similar to the one shown in the sketch.

As far as I am aware, there is no rule on the market similar to the one described above, and, if this be the case, this rule may be constructed or ordered from any instrument maker, as no patent has been taken out for it, nor have any arrangements been made with any firm for its manufacture. Having made a rule for myself, which has been very useful to

me in my work, I have described it fully in the hope that it may prove equally useful to other members of the engineering profession.

Table giving positions of stations C and A for pipe sewers flowing half full. All distances measured from left of scale in inches.

Size of Pipe.	Sta. C.	Sta. A.
4″ diameter	11·29119	4·49028
6″ ,,	12·00881	6·96881
9″ ,,	12·70515	9·42606
12″ ,,	13·18591	11·15621
15″ ,,	13·55110	12·49050
18″ ,,	13·84447	13·57569
21″ ,,	14·08901	14·48969
24″ ,,	14·29825	15·27885

Table giving positions of Stations C and A for oval sewers flowing two thirds full. All distances measured from left of scale in inches.

Size of Sewer.		Sta. C.	Sta. A.
1′ 6″	2′ 3″	9·14424	10·19886
1′ 8″	2′ 6″	9·31046	10·82265
1′ 10″	2′ 9″	9·45953	11·38565
2′ 0″	3′ 0″	9·59457	11·89857
2′ 2″	3′ 3″	9·71790	12·36953

NOTES ON LEGISLATION AND LAW CASES.

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For full text of these see Law Reports, which can be referred to in the Library of the Institute.

RATES.—*Sewage farm—Poor rate—Assessment.*

A sewerage board, being under a statutory obligation to dispose of the sewage of a district, acquired for the purpose a farm, on which they laid pipes and constructed channels for the distribution of the sewage. This farm they let to a tenant as a sewage farm. The rent reserved by the lease was a fair rent for the farm as agricultural land, including the manurial value of the sewage:—

Held, that, in assessing the value of the farm, the rating authority were bound to take into consideration the benefit accruing to the sewerage board from the farm as a means of enabling them to discharge their statutory duties.

Decision of Divisional Court (1906) 1 K.B. 214, reversed.

Davies v. Seisdon Union, C.A. 630 (April, 1907).

WATER.—*Watercourse—Pumping operations—Causing water to percolate out of stream—Cause of action.*

The defendants were the owners of a well and pumping station situate at a distance of about twenty yards from a natural stream. This well was for seventy-six feet of its depth from the top lined with steel cylinders, so that no water from the adjacent soil could obtain access to the well except at a greater depth than seventy-six feet. The plaintiff was a riparian owner lower down the stream. The effect of the defendants' pumping from the well was that the general level of the water in the soil in the neighbourhood of the well was lowered to the extent of about twelve inches, with the result that the soil became dry, and a portion of the water flowing down the stream leaked out through the bed and side of the stream, so that the volume of the water in it was substantially diminished by the time it reached the plaintiff's land. None of the water, however, which so escaped from the stream in consequence of the defendants' pumping found its way into the defendants' well:—

Held, that as the defendants did not appropriate any of the water of the stream by pumping it up through their pipes, but merely caused it to sink a short distance into the ground by reason of their withdrawing the support of the lower subterranean water, the damage to the stream gave no cause of action.

Grand Junction Canal Co. v. Shugar (1871) L.R. 6 Ch. 483, distinguished.

English v. Metropolitan Water Board. Lord Alverstone C.J. 1 K.B. 588 (April, 1907).

Yrs. truly

J. Fayrer

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THE

MAIN DRAINAGE OF EASTBOURNE.

By A. ERNEST PRESCOTT,

Borough Engineer, Eastbourne.

(MEMBER.)

Read at Sessional Meeting, Eastbourne, May 18th, 1907.

THE provision of good drainage and pure water are two of the most important duties devolving upon local authorities, but more especially does this apply to seaside and other visiting resorts which cater for the health and pleasure of numerous visitors.

The object of this paper is to describe, as briefly as possible, the main drainage of the Borough of Eastbourne, the larger portion of which is of comparatively recent date.

Before the year 1881 Eastbourne was drained by gravitation, but owing to the rapid development of the town it was found necessary to supplement the then drainage by extending the main sewers in various parts. Owing to a large area lying at a low level and being subject to flooding, a scheme of pumping was resorted to, and the town was divided into high-level and low-level areas of 772 and 543 acres respectively.

The Shone system of raising sewage was adopted, and consisted in the erection of an air-compressing station, with the necessary machinery for supplying compressed air to a main ejector station and two sub-stations, in the low-lying parts of the town.

In 1894 the provision made for the main drainage of the town was again found to be inadequate. During high tides and heavy rains the

sewers were surcharged, and the low-lying parts of the town were extensively flooded. The Corporation therefore consulted the late Mr. Henry Law, M.Inst.C.E., who submitted a report and designed a scheme for the further extension of the then existing system of drainage and the prevention of flooding, at the same time making provision for the future growth and development of the borough.

The area of Eastbourne at the present time is 5,710 acres, and of this some 1,315 acres are built over.

The following figures relate to the population of the town, and shew its growth between the year 1881 and the present time :—

1881	21,510
1891	34,968
1901	43,344
Present time, estimated	50,000

For the purpose of drainage the town is, as already stated, divided into separate and distinct areas, high-level area of 772 acres, and low-level area of 543 acres.

Low-Level Drainage.

The greater portion of the drainage gravitates to the main ejector station situate at the district called "The Archery," and from this point, at certain states of the tide (which has a range of 22 ft. 6 in.), can be lifted a height of 26 ft., and thence gravitate to its point of discharge through the outfall sewer along the Crumbles to Langney Point.

The other portion of the sewage is dealt with in two low-lying areas, (*a*) at the Wish Valley, which drains some 25 acres, and where the sewage is lifted 31½ ft. and discharged into a sewer connected to the main low level, and is thus lifted again at the main station, and (*b*) at the Bourne Valley, where the sewage is lifted 21½ ft. to a high-level sewer, and which drains about 20 acres.

High-Level Drainage.

The sewage from the high-level area gravitates direct through the high-level outfall sewer to the same point of discharge as the low-level, Langney Point.

Main Sewers.

Low Level.—The main low-level sewer is 1½ miles long, has a gradient of 1 in 474, and commences at a point in Terminus Road near the station,

and continues along Terminus Road, Langney Road, and thence along Seaside to the Archery.

It is an egg-shaped brick sewer, 3 ft. 9 in. by 2 ft. 6 in. throughout the greater portion of its length, increasing to 4 ft. 6 in. dia. iron pipe sewer, and varying in depth from 8 to 16 ft.

This low-level sewer receives the sewage lifted from the low-level area at the Wish Valley at a connection in Terminus Road, which then gravitates to the main ejector station at the Archery.

All the subsiduary low-level sewers are, of course, connected to the main low-level trunk sewer en route.

High Level.—There are two main high-level sewers which collect the high-level sewage from the districts north and west of the railway station, viz., Upperton, Old Town, and Meads, by a large subsiduary sewer from each district, and which unite at a point in the upper portion of Terminus Road.

It is necessary here to state that one of these two main sewers is the old high-level sewer which existed prior to 1894, and which was retained to act as an overflow or relief to the second or new high-level sewer which was laid when Mr. Law's scheme was adopted.

The new sewer is 4 ft. 6 in. in diameter, varying in depth from 7 ft. to 14 ft., has a gradient of 1 in 787, is constructed with iron pipes for a portion of its length, and wholly of concrete for the remainder until its junction with the line of outfall sewers.

It is laid along Terminus Road, and at the junction of Langney Road there is an overflow chamber connecting the old high-level sewer, which is thus brought into use in times of storm.

From this point the new high-level sewer continues along Pevensey Road, across Seaside, into and along Latimer Road, joining the line of outfall sewers on the Crumbles, a total distance of $1\frac{5}{8}$ miles.

The old high-level sewer is circular in section, built of brickwork, and is 3 ft. in diameter. It continues its old course from its junction with the new high-level sewer at the overflow chamber mentioned above, and thence along Langney Road, Seaside, to the main station at the Archery. It varies in depth from 4 to 10 ft., and is just over $1\frac{1}{8}$ miles in length.

En route it passes the Bourne Valley low-level area and receives the sewage discharged from the ejectors at this point.

OUTFALL SEWERS FROM MAIN EJECTOR STATION.

The low-level sewer, and the old high-level outfall sewer from the main station at the Archery to the sea, were reconstructed and enlarged under

Mr. Law's scheme from 3 ft. diameter brick sewers to 4 ft. 6 in. diameter iron pipes, and laid together for some little distance until the new high-level sewer joined the line of outfall, and from this point the three sewers (each 4 ft. 6 in. in diameter) continue side by side on their respective gradients, for a distance of about 1¼ miles, along the Crumbles to the Outfall at Langney Point.

Here a concrete valve chamber is built, in which heavy counter-balanced flap valves are fixed on the shore side of the sewers.

The three sewers then continue for a distance of about 120 yards on timber piling and concrete, and discharge into the sea at a level 6 ft. below Ordnance Datum, or 4 ft. above low-water level. This point of discharge is favourably situated, being some 2 miles along the coast from the pier eastwards, and the set of the tides is such that at all times the sewage is carried out to sea.

At the main ejector station the hinged valves are so arranged that at low water the sewage in the low-level sewer can gravitate without interruption direct to the outfall, but, as the tide rises and the flow of sewage is thus checked, the water or sewage is allowed to reach a height of 4 ft. 6 in. above the invert of the low-level sewer at the Archery, or ·77 above Ordnance Datum, when it automatically starts the ejectors by lifting a float, which actuates a small valve admitting compressed air to the ejectors and at the same time closing automatically the valve on the low-level sewer, thus sealing the flow of sewage.

These ejectors then pump the sewage held back in the low-level sewer into the sewers on the sea side of the valve chamber, where it is forced through the outfall against the pressure of the sea. This continues until the pressure of the sea is released by the ebbing tide, when the sewage again flows by natural gravitation, the reverse action of the float takes place, the air supply is automatically cut off, the ejectors cease working, and the hinged valve is automatically raised, thus allowing the impounded sewage to gravitate into the outfall sewers.

The high-level sewers gravitate at low water, but during high water they are under pressure according to the duration and height of the tide.

Ejectors.

Main Station Ejectors.—The ejectors used for lifting the sewage are five in number, two of 2,000 gallons capacity, one of 1,500, and two 1,000 gallons; they are each capable of being filled and discharged in one minute, so that the pumping capacity is equal to 10,800,000 per day of

24 hours; but, as a matter of fact, it was only necessary for them to pump 520,375 gallons per day during the year ending March 31st, 1907, as, of course, pumping is only resorted to during high tides and when the flow of sewage is abnormally high in the low-level sewer.

Sub-Station Ejectors.—At the Wish Valley station there are three ejectors, two of 400 gallons and one of 200 gallons capacity, each capable of being filled and discharged once a minute, and therefore able to lift 1,440,000 gallons per day of 24 hours; during the year ended on March 31st last they lifted 66,151 gallons per day.

At the Bourne Valley station the ejectors are two in number, each 380 gallons capacity, and able to discharge 1,094,400 gallons per day; during the past year these ejectors pumped 494,975 gallons per day. They are situate in water-logged ground, and therefore this large quantity from so small a district is due to the admission of sub-soil water through the pipe joints of the old sewers, which are not altogether watertight.

The working of Shone's pneumatic ejector is now so well known that I need not explain it here. There is a small working model at the compressing station.

Air Mains.—All the ejectors are actuated by compressed air, which is conveyed along cast-iron pipes laid under the surface of the road from the air-compressing station to the various ejector stations, the Archery main station 340 yards, the Bourne Valley sub-station over one mile, and the Wish Valley station a distance of nearly two miles. The diameters of these air mains vary from 2 in. to 10 in., and the working pressure of air is 15 lbs. per square inch. Very little trouble has been experienced with these mains, the loss through leakage being practically nil. Stop valves have been fixed at intervals along the route for the purposes of testing, and to facilitate repairs.

AIR-COMPRESSING STATION.

The air for supplying the ejectors at various points in the town is compressed in a station near the Archery, which adjoins the Borough refuse destructor.

The air-compressing station was erected in 1881, but was enlarged in 1895 when the outfall sewer was reconstructed and additional ejector plant was installed.

It has again, recently, been extended to make room for further machinery, and contains:—

Two 25 i.h.p. horizontal single cylinder condensing engines; two 75 i.h.p. semi-vertical high-pressure non-condensing double cylinder engines; and one 150 i.h.p. horizontal high-pressure non-condensing double-cylinder engine.

This last engine has only been recently erected, and its duty is to act as a standbye in case of severe storms or break-downs.

The engines compress air to a working pressure of 15 lbs. per sq. inch.

Four cylindrical steel shells, each 6 ft. in diameter and 18 ft. long, act as receivers for the compressed air, from which the ejectors draw as required.

Two Lancashire boilers, each 30 ft. by 6 ft., were originally used to supply steam to the air compressors, but as all the steam required is generated at the refuse destructor works adjoining, these Lancashire boilers are only used occasionally, when the destructor flues are being cleaned, when the refuse in the destructor is too wet to enable a sufficient supply of steam to be raised, and when the week-end refuse is of insufficient quantity.

The total cost of working the air compressing and ejector stations for the year ending March 31st, 1907, including all labour, materials, repairs, and maintenance charges, amounts to £858 5s. 5d.

The total number of gallons pumped during the year is 359,323,000. Therefore, the cost of pumping per thousand gallons is ·57d.

Refuse Destructor.

As the refuse destructor is inseparable from the compressing station, a brief description of this plant will not be out of place.

The old destructor was erected some seventeen years ago, but it has recently been reconstructed and considerably enlarged on up-to-date lines.

The furnaces, etc., were reconstructed by Messrs. Manlove, Alliott & Co., but the building and inclined roadway were carried out by the Borough Surveyor's department.

The cells are six in number, with three Babcock & Willcox water-tube boilers, but as the plant is now more than sufficient to deal with the refuse delivered, four cells and two boilers only are put in use. A large fan, and an engine for working the same, supplies the forced draught necessary for thoroughly burning the refuse, and steam is raised to an average pressure of 70 lbs. per square inch for supplying the air-compressing machinery.

This does not represent the full steam-raising power of the plant, for the furnaces and boilers are designed to be capable of raising 150 lbs. pressure of steam, but 70 lbs. is all that is required for ordinary purposes.

The total amount of refuse burnt during the year ending March 31st, 1907, was 13,193 tons, which is equal to an average of 43¼ tons per day, *i.e.*, when refuse is delivered.

The work is divided into two shifts, so that the furnaces are kept constantly burning except on Sundays, when the flues are cleaned, and at these times the small Lancashire boilers in the air-compressing station are fired.

Under the present conditions the destructor produces satisfactory results, and in a recent forty-eight hours' test that was made, it was found capable of raising ·725 lbs. of steam per lb. of refuse burnt, and the average steam pressure maintained was 144·72 lbs. per square inch.

SURFACE-WATER DRAINAGE.

Where suitable outfalls have been found, surface water sewers have been constructed with a view to relieving the high-level and low-level sewers in the town, and increased pumping.

At present two portions of the high-level districts and two portions of the low-level districts are served with surface-water drains, the outlets from the former being the Bourne stream (an old watercourse now culverted over), and a pipe discharging into the sea at the west end of the town. The first low-level outlet discharges into the sea near the Wish Tower, and the second outlet also discharges into the sea near the eastern end of the Parade, but owing to its being unable to discharge at all states of the tide, a large storage tank, capable of holding 140,000 gallons, retains the storm water at high tide and discharges its contents at low water.

The pipes for these surface-water drains vary in size from 9 in. to 36 in. in diameter, and are of stoneware and iron to suit the varying conditions of the ground.

A large quantity of surface water can still be excluded with advantage from the low-level sewers, and a comprehensive surface-water scheme including the whole of the town is now being prepared. Such a scheme, however, will only include the surface water from roads, as the separate system of house drainage was not originally enforced, and obviously cannot now be dealt with.

Ventilation of Sewers.

The whole of the sewers are efficiently ventilated at suitable points by means of up-cast iron or steel ventilating columns, generally connected to the dead ends and on steep gradients. These columns vary from 6 in. to 9 in. in diameter.

Similar ventilation is also provided to all common drains, which also act as ventilators to the main sewers. There are now very few open surface manhole covers. The open manhole covers have been sealed from time to time and ventilating columns substituted.

General.

This paper would be incomplete without a reference to the late Mr. G. A. Wallis, who designed the first portion of the main drainage for Eastbourne, and the late Mr. Henry Law, who designed the scheme for extension in 1894, and which latter work cost £81,000. This work was efficiently carried out by administration, under the supervision of my predecessor, Mr. R. M. Gloyne. My experience here gives me some knowledge of the loose and water-logged condition of the ground which had to be dealt with during construction, and it is sufficient testimony to the engineering skill and ability which Mr. Gloyne brought to bear in the execution of this scheme, that it has done its work efficiently and well, and has thus far stood the test of time.

Mr. R. Maynard Gloyne (London) thanked Mr. Prescott for his interesting paper with regard to the drainage of Eastbourne. Not only were additions made to the scheme in 1881 and 1894, but also in 1884 and 1891. Between 1881 and 1901 the population of the borough more than doubled. In order to keep pace with this growth neither the Corporation nor the ratepayers had taken any trouble about increasing the drainage, which that abnormal increase of population had caused. He had the privilege, as well as the anxiety, of carrying out, by administration, that scheme which Mr. Henry Law prepared, and to which Mr. Prescott had referred, and he noticed that even now the population of Eastbourne was increasing in a considerably greater ratio than was contemplated when that scheme of the late Mr. Law's was prepared. He pointed out that when that plan was submitted there was a distinct recommendation that later on surface-water sewers should be constructed in various parts of the town, independently of Mr. Law's scheme. There appeared to be some little confusion arising with regard to the sewers in Terminus Road,

between the Railway Station and Langney Road. Originally the old sewer, which was put in in 1865, drained the town by gravitation. It was supplemented in 1884 by a high-level sewer, three feet in diameter, which was put in for the purpose of dealing with storm water. It was found necessary to take this in as a sewer proper, and that sewer for the portion of the road lying between Langney Road and the Railway Station has been replaced by iron pipes (4 ft. 9⅝ in. in diameter). There were only two main sewers in Terminus Road. Mr. Gloyne was not at all satisfied that the information he had would lead them to suppose that tall ventilating columns were the solution of the sewer ventilating question. He was inclined to doubt it. He had had an opportunity of inspecting at Leicester a small installation of mechanical ventilation by means of an electrically-driven fan and regulated air inlets with large upcast exhaust, as propounded and supplied by Messrs. Shone & Ault. Mechanical ventilation might possibly be the solution of this question. Mr. Law provided for a consumption of water to the extent of forty gallons per head, and storm water to the extent of five and a half cubic feet per acre per minute, but he always made a proviso for surface-water drains.

MR. W. KAYE-PARRY (Dublin) observed that whilst failures were always instructive, successful works were at least equally so, and the paper showed that Eastbourne was a good example of how to deal effectively with the sewage of a sea-coast town. One of the difficulties which confronted the engineer in this case was the abnormal growth of the population. From Mr. Law's report he gathered that between the years 1851 and 1894 the population had increased 6½ times. The exceptional range of the tide constituted another difficulty, and the comparatively large area of low-lying land which had to be drained was also an obstacle. There were many features in the drainage system which commended themselves to the speaker. One was the absence of any provision for storing or tanking the sewage. His experience was that whether sewage were treated or discharged untreated the more rapidly it was transported to its destination the better. The author of the paper had stated that under no conditions was the sewage carried back on the beach. This was most interesting, because many watering-places had suffered from the evil results of an unsuitable point of outfall. Mr. Kaye-Parry was of opinion that a Foreshore Pollution Prevention Act was quite as much needed as the Rivers Pollution Act. Those who believed in the merits of the Shone ejectors found at Eastbourne an excellent illustration of the successful working of this system. The only real objection which had ever been urged against these ejectors was that the efficiency was low when compared with that which was obtained in other forms of power transmission. This objection would not bear examination, because, although theoretically it was true, nevertheless in practice the ejectors were found to do their work so well, and to cost so little for upkeep and repairs, that the results achieved would compare favourably with those obtained from any other system.

He cited a case where an hydraulic plant for power transmission for lifting sewage had been put down some eleven years ago. He had ventured to predict that it would give trouble, and he had lived to see his prophecy fulfilled. The hydraulic pumps were now on the scrap-heap and ejectors were being erected in their places.

Mr. A. E. Nichols (Folkestone) congratulated Eastbourne on its good fortune in having tides which would allow sewage to be turned direct into the sea at all times with no fear of sewage pollution on the foreshore. If other places were as fortunate many difficulties would be overcome, as well as great sums of money saved which now had to be expended in tank accommodation. It would be useful if Mr. Prescott would give information with regard to the costs of pumping, not only with reference to whether steam was charged for from the destructor works but also as to whether the cost included interest and repayment on capital outlay, this being a most important item, as an installation costing a fabulous amount might shew on paper a very small working cost, whilst if the interest on such outlay and the amount of the repayment of loan were included, as they ought to be, the cost might be excessive. With regard to the ventilation of sewers, Mr. Nichols agreed that some engineers were in favour of no ventilation, whilst others were of opinion that free ventilation was desirable. He hoped that the ventilation proposed to be fixed in the streets of Eastbourne would not be so offensive as one fixed some time ago in Folkestone, which was so offensive that complaints of sore throat in the district were general; the ventilator, therefore, had to be removed. It might be mentioned, by the way, that this ventilator as a matter of fact had never been connected with the sewer. It was only another case showing how far one could be carried by imagination. Mr. Nichols also mentioned that they had in Folkestone a self-registering rain gauge, which was found to be very useful in indicating not only the quantity of rain, but the rate of fall, and the diagrams gave surprising results to those who had never actually followed out the question of rate of flow. He strongly advised the Corporation of Eastbourne to provide one for their borough engineer, who would find it most useful in his calculations for dealing with storm water.

Mr. Prescott, in responding to the vote of thanks, said he was obliged to Mr. Gloyne for one or two matters which he had pointed out, but the scope of the paper was so large that it would be impossible to go into much detail in the limited time for reading and discussion. With reference to the figures given in connection with the upkeep of the Air Compressing Station, he stated that the charge did not include any portion of the cost of the destructor plant, for the reason that (and he would like this to be clearly understood) if the Air Compressing Station was not in existence the Destructor would still have to fulfil its duty of destroying refuse, and the expense, mainly labour,

entailed would still have to be incurred, no matter whether steam was raised for pumping or not. The amounts stated did not include capital charges for sinking fund and interest, but were simply maintenance charges for the year. With regard to the ventilation of sewers, he was satisfied to judge by results; and it was found in Eastbourne that the erection of tall ventilating shafts did away with bad smells from the sewers, and the results therefore justified him in continuing the system. He agreed with one of the previous speakers when he said that he did not care where the foul emanations dispersed at a height of twenty-five to thirty feet, so long as the nuisance was abated at the road level. Replying to Mr. Kaye-Parry, he said that when the outfall sewer was originally laid down float observations were carefully taken, and the set of the tides had proved very satisfactory, being generally west to east, and from thence setting immediately seawards, so that at no state of the tide was any sewage found to come back upon the foreshore.

THE MAYOR OF EASTBOURNE, COUNCILLOR SHARP, MR. WOOLDRIDGE, Surveyor of Woking, and DR. WILLOUGHBY also took part in the discussion.

DESCRIPTION OF THE EASTBOURNE ISOLATION HOSPITAL.*

By W. G. WILLOUGHBY, M.D., D.P.H.

THE plan of the buildings and proposed additions, and also of one of the pavilions, given on pages 223 and 224, will show the general arrangement of the hospital.

Two pavilions, by agreement with the Eastbourne Schoolmasters' Association, are retained for the exclusive use of the Association, which represents practically the whole of the leading boarding schools for boys. This arrangement does away with any necessity for schools to add local sanatoria for their scholars. The isolation at such local and small sanatoria almost invariably leaves much to be desired. For the use of these pavilions a retaining fee of £150 per annum is paid, being 5 per cent. on the cost of the building.

Two pavilions are similarly retained by the Schoolmistresses' Association. The retaining fee is £180 per annum—rather more than in the case of the Schoolmasters' Association, owing to the increased cost of building, these two pavilions being new ones. The medical officer of health has sole charge of these as of other pavilions.

The total present accommodation is therefore—

For Scarlet Fever	33 beds	In permanent buildings.
For Diphtheria	25 „	
For Enteric Fever	4 „	
	62	
For Emergencies	17 beds in an iron building.	
	79	

A few of the above beds are so arranged in small wards that they can be used for isolation and observation.

As most of the patients are children, and the above accommodation is based on calculations for adults and according to the Local Government Board scale, the numbers may on occasion be exceeded.

The number of admissions in 1906 was larger than that of any year since 1901. The popularity of the sanatorium has been well maintained. In no year has so high a percentage of cases been admitted. Ten years average 91·3 per cent.

In 1906 there were proportionately fewer deaths than there have ever been before, viz., 2 per cent. of the patients.

* Visited by the Members of the Institute on May 18th.

The average duration of stay in hospital of those 167 patients who completed their stay in 1906 was 44·4 days. In 1905 it was 35·8; and in 1904, 40·5.

The average length of stay of the patients depends on the proportion of diphtheria cases admitted. Enteric fever and scarlet fever patients stay a longer time.

The permanent resident staff of 1906 included an increase of one nurse and one wardmaid as compared with 1905, and was as follows:—

Matron.
1 Sister
1 Charge Nurse } Eight.
6 Assistant Nurses
3 House Servants
3 Ward Servants } Eight.
1 Laundress and an Assistant
1 Porter (who also manages the steam disinfecting).
1 Ambulance Driver (who spends his spare time at work at the hospital).
1 Gardener.

Additional assistance in nursing was occasionally necessary, amounting altogether to an addition of one nurse for 37 weeks in the year.

The following are the amounts paid for the sanatorium for the year September 30th, 1905, to September 30th, 1906. The accounts for the previous years are added for comparison:—

	1904. Oct. 1st, 1903, to Oct. 1st, 1904.			1905. Oct. 1st. 1904, to Oct. 1st, 1905.			1906. Oct. 1st, 1905, to Oct. 1st, 1906.		
	£	s.	d.	£	s.	d.	£	s.	d.
Keep	393	5	0	500	1	2	608	10	2
Wages	804	4	6	799	0	10	832	10	0
Fuel	169	14	8	188	3	3	201	14	9
Electricity, Gas, Water, Taxes..	130	3	8	139	6	11	154	4	7
Drugs	22	8	6	47	8	6	58	12	8
Furniture, Fittings, and Repairs	113	15	9	122	5	2	124	7	2
Drapery and Uniforms ..	49	0	2	30	3	2	43	2	1
Forage and Stable	27	19	0	37	0	1	34	1	1
Other Items	76	8	4	88	6	1	84	3	3
Plants, Seeds, etc.	12	13	11	6	6	1	6	0	0
Re-decorating, Painting, etc. ..		—		54	14	9	121	13	4
Alteration to Wall	42	5	0		—			—	
	£1,841	18	6	£2,112	16	0	£2,268	19	1

(For the information as to income and expenditure I am obliged to Mr. Sparrow, the Borough Accountant, and the other figures I have calculated therefrom.)

The above costs include the expenses of the disinfecting apparatus, the general disinfecting for the Borough, the horse and ambulance, and all matters connected with the hospital, except sinking funds and charges on capital.

The amount received in fees from patients at the sanatorium during the financial year Oct. 1st, 1905, to Oct. 1st, 1906, was £126 7s. 8d.; £297 2s. was received from the Schoolmasters' and Mistresses' Associations, and £4 3s. for the sale of garden produce, etc., the total income being £427 12s. 8d.

The total cost in 1906 was more than in 1905 and 1904, but less per patient per week. The peculiar nature of an isolation hospital demands the keeping of a staff and a provision of beds out of proportion to the number of patients unless an epidemic exists, for the various diseases cannot be mixed as they are in a general hospital.

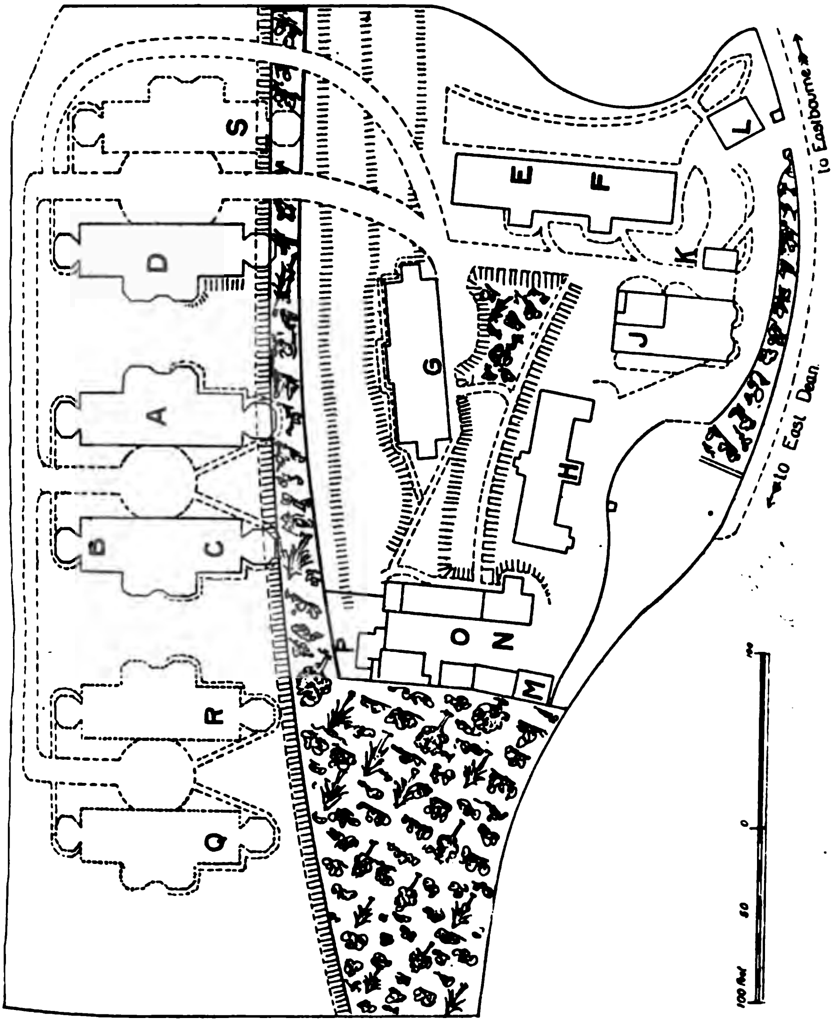
The cost per patient per week was £2 3s. 2d., as compared with £4 6s. 7d. in 1904, and £3 18s. 2d. in 1905.

The "Keep," including the staff, amounted to £608 10s. 2d.—this includes extras ordered for patients and repaid by parents, etc. It represents an average of 6s. 2d. per head per week as compared with 8s. 2d. in 1905, a change due very much to the increase in number of patients.

Re-decoration accounts for much of the increase. The increases in wages, fuel, and keep are due to the increased number of patients.

The net cost to the ratepayers as a whole of the sanatorium, inclusive of everything but capital charges and sinking fund, was £2,268 19s. 1d. less £427 12s. 8d.—*i.e.*, £1,841 6s. 5d., or at a rate well short of one penny farthing in the pound.

The hospital has remained free to the poorer classes.



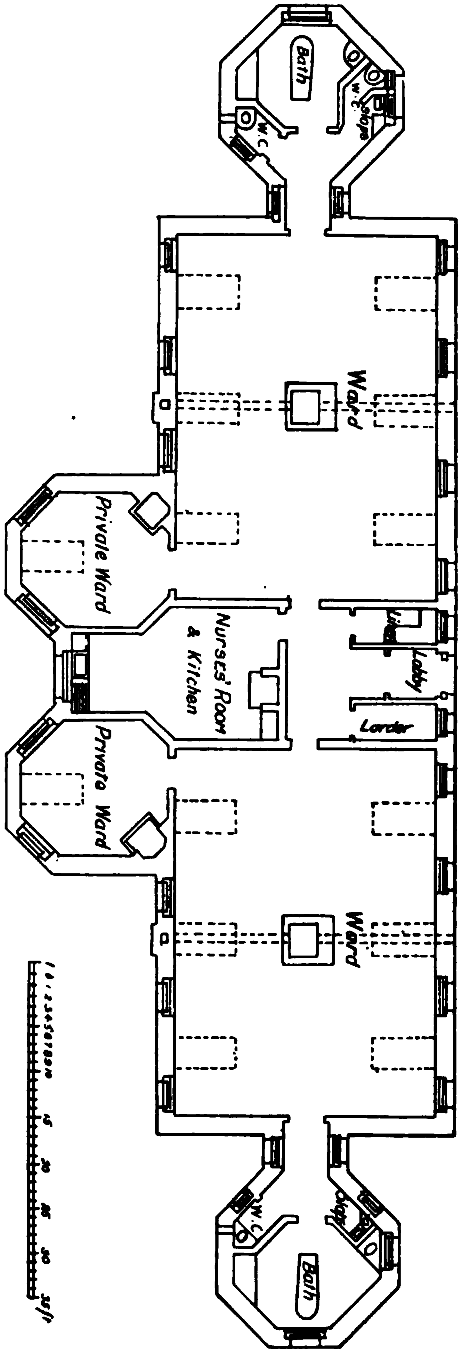
EASTBOURNE ISOLATION HOSPITAL.

(General Plan.)

A—G, Wards: A, Scarlet Fever; B, Diphtheria (Girls' Schools); C, Scarlet Fever (Girls' Schools); D, Diphtheria; E, Enteric (General); F, Diphtheria (Boys' School); G, Scarlet Fever (Boys' School).

H, Iron Emergency Building; J, Administration Block; K, Discharge Block; L, Porter's Lodge; M, Stable; N, Disinfecting Machine; O, Laundry; P, Local Destructor; Q, R, S, Proposed New Wards.

Plan.



EASTBOURNE ISOLATION HOSPITAL.

(Plan of one of the Pavilions.)

DISCUSSION ON SUGGESTED AMENDMENTS OF THE LONDON COUNTY COUNCIL BY-LAWS AS TO DRAINAGE.

Opened by

LOUIS C. PARKES, M.D., D.P.H.,

Medical Officer of Health of the Metropolitan Borough of Chelsea; Consulting Sanitary Adviser to His Majesty's Office of Works; Civilian Sanitary Member of the Advisory Board for Army Medical Services.

(FELLOW.)

And J. PATTEN BARBER, M.Inst.C.E.,

Borough Engineer, Islington.

And ISAAC YOUNG.

Chief Sanitary Inspector, Battersea.

(MEMBER.)

Read at Sessional Meeting, London, May 29th, 1907.

LOUIS C. PARKES, M.D., D.P.H.

IN considering any possible amendments of these by-laws, the most important point to determine is whether, since the by-laws were first promulgated, there has been any change in principle, following on new developments of science, which would cause any change in the practical application of the methods of drainage now in vogue. For myself, I do not think that there has been any such alteration in opinion of those qualified to judge, as to render necessary any drastic change in the by-laws we are familiar with.

The question of the disconnecting trap on the house-drain before its connection to the sewer has been the subject of discussion at this Institute; but I do not think there was any overwhelming opinion in favour of the abolition of house-drain disconnection. The views of those who favour abolition have been well and forcibly put, and coming as they do from men of sound knowledge and great practical experience, are worthy of all respect. Personally, I am in favour of house-drain disconnection, as possessing advantages which over-ride, in my opinion, its demerits. But

this is not a matter that need be discussed *ab initio*, as a full debate on this very question has so recently taken place. I would, however, like to remind you that the recent work of Major Horrocks, R.A.M.C., at Gibraltar (a full report of which is given in The Royal Sanitary Institute Journal for this very month of May) somewhat justifies the opinions of those sanitarians who still hold to the old-fashioned belief that sewer air is sometimes, at any rate, the exciting as distinguished from the predisposing cause of disease. Horrocks's conclusions are short and to the point, and are worth quoting on this occasion.

"The experiments show that:—

"1. Specific bacteria present in sewage may be ejected into the air of ventilation pipes, inspection chambers, drains, and sewers, by (*a*) the bursting of bubbles at the surface of the sewage, (*b*) the separation of dried particles from the walls of pipes, chambers, and sewers, and probably by (*c*) the ejection of minute droplets from flowing sewage.

"2. A disconnecting trap undoubtedly prevents the passage of bacteria, present in the air of a sewer, into the house-drainage system.

"3. An air inlet, even when provided with a mica valve, may be a source of danger when it is placed at or about the ground level."

The only other matter I wish to draw your attention to is what I believe to be the dangerous emanations that arise from the open ends of waste pipes receiving the discharges of sinks (especially kitchen sinks), baths, and lavatory wash-hand basins. The existing by-laws permit all these appliances to discharge into pipes with open hopper heads, very often situated in the near neighbourhood of windows. Nearly as dangerous as the open hopper heads are the anti-siphonage pipes, or puff pipes, to the wastes that terminate flush with the wall, often under windows of living or sleeping rooms.

The nuisance and danger from these causes are especially great in the case of block dwellings: mansions, flats, and industrial dwellings. In the case of mansions let in flats I have had several instances brought to my notice of illness (which was, I believe, attributable to the emanations from waste pipes) where the systems above described were in existence. Generally the illness was of the nature of septic throat, and in one instance a case of diphtheritic throat was associated with the sanitary defects found. I believe that the patient acquired the diphtheritic virus elsewhere than in his flat, but he was exposed to noxious emanations from a waste pipe, which may in his case have determined the onset of the disease. In another instance a gentleman suffered much from boils whenever he was in his town flat, but got better when he went away for a change. The only sanitary defects found were the open puff pipes of a series of kitchen

sinks beneath his bedroom window, his flat being nearly on the top floor of the mansions.

It must be remembered that in flats the kitchen sinks, which discharge the filthiest water and contain putrefactive matters in a concentrated degree, are situated on every floor. The hopper heads become coated with grease, slime, soap, and organic matters from washing up, and the pipes themselves are internally coated with similar matters. The wastes are open at the bottom over gullies, so that a constant current of air traverses them, usually in an upward direction. The heat of the waste waters discharged also aids in promoting putrefaction of matters deposited on the inner linings of the pipes. Is it wonderful that, under these conditions, the open heads are complained of as offensive?

It was formerly considered that only excretally soiled pipes and fittings were liable to be dangerous to health, but this view is no longer tenable in the light of our larger knowledge.

The alterations to the by-laws that I have drafted to remedy the condition of things above alluded to, are set out below in the form of an addition to By-law No. 10.

Addition to By-law No. 10:—

Waste Pipes of Kitchen Sinks in Block Dwellings.

A person who shall erect a new building designed to be let in flats or tenements, shall cause the waste-pipes of kitchen or scullery sinks on all floors of such building above the lowest to discharge into a pipe external to the building; such pipe to be carried down to discharge into a gully on the ground level, and to be carried up full bore to above the roof for ventilation. He shall not construct such waste-pipes of kitchen or scullery sinks as to cause them to discharge into open hopper heads; and he shall cause the joints of all pipes receiving the discharges of kitchen and scullery sinks to be securely made so as to be air-tight. He shall not ventilate the branch waste-pipes of kitchen or scullery sinks except by anti-siphonage pipes, which shall be carried up full bore to a point above, and not in the neighbourhood of any windows in such building.

Waste-pipes of Baths and Lavatory Basins in Block Dwellings.

A person who shall erect a new building designed to be let in flats or tenements, shall cause the waste-pipes of all baths and lavatory basins on all floors of such building above the lowest to discharge into a pipe external to the building, such pipe to be carried down to discharge into a gully on the ground level, and to be carried up full bore to above the roof

for ventilation. He shall not construct such waste-pipes of baths and lavatory basins as to cause them to discharge into open hopper heads; and he shall cause the joints of all pipes receiving the discharges of baths and lavatory basins to be securely made so as to be air-tight.

Connection of Kitchen Sink and Bath Waste-pipes.

If he causes the waste-pipes of baths and lavatory basins to discharge into the same pipe which receives the discharges of kitchen or scullery sinks, he shall cause any anti-siphonage pipes which he may affix for the purpose of ventilating the branch waste-pipes of such baths and lavatory basins to be carried full bore to a point above, and not in the neighbourhood of any windows in such building.

Proviso as to Anti-Siphonage Traps.

For the purposes of this by-law it shall be lawful to connect together in one pipe the anti-siphonage pipes of any baths, lavatory basins, kitchen or scullery sinks, provided that such pipe is carried up full bore above any windows of such building as hereinbefore provided.

J. PATTEN BARBER, M.Inst.C.E.

DRAINAGE and sanitary work in the metropolis is subject to three sets of by-laws made by the London County Council: one relates to the submission of plans, sections, and particulars of the proposed work, and is made under the Metropolis Management Acts Amendment (By-laws) Act, 1899; another deals with drains, traps, and sanitary fittings, and is made under the Metropolis Management Act, 1855, section 202; and the third, made under the Public Health (London) Act, 1891, refers to w.c.'s, earth-closets, privies, ashpits and cesspools. It will be convenient to consider the by-laws in this order.

By-Laws requiring the submission of Plans, Sections, and Particulars of Proposed Work.

By-law 1 (2).—The scale prescribed for plans and sections is not less than 1 in. to 16 ft. Except for large buildings this scale is too small for the details of drainage and sanitary fittings to be clearly and accurately shown; a one-eighth scale is found much more convenient in both the preparation and examination of the plans and sections, and in the setting out and checking of the work.

This paragraph contains an important requirement, which is often

overlooked by those who submit plans of proposed work, viz., that the position, form, levels and arrangement of the several parts of any building, including the roof thereof, in connection with which the proposed pipes or drains are to be used, must be shown on the plans and sections to be deposited with the sanitary authority. Information as to the manner in which rain-water from roofs, areas, paved surfaces, and paths is to be conveyed away is frequently omitted, and in such cases it is only by specific enquiry by the borough engineer that anything can be learned respecting the drainage of these portions of the premises. In some cases the information is refused, or the enquiry is regarded as either unnecessary or vexatious. Seeing that it is only necessary that rain-water or sewage from adjoining premises should flow into a drain used for the drainage of other premises in order to convert the drain into a sewer, and render the public liable for its repair and maintenance, it is of the highest importance that precautions should be taken to ascertain whether, in any scheme submitted to a sanitary authority, there is a likelihood of such a liability being put upon the ratepayers, whose interests the authority is bound to protect. Many thousands of pounds have been and are still spent by metropolitan borough councils in reconstructing sewers which were first constructed as private drains, and which have subsequently been discovered to be sewers, through the very simple circumstance of their receiving some of the rain-water from the roof of premises adjoining those for whose drainage they were originally provided. The by-law does not require that plans, sections, and particulars of proposed drainage work shall show whether sewage or rain-water from other premises is to be conveyed by the drains of the premises in respect of which the plans are submitted. And borough councils have frequently to incur the expense of reconstructing drains which are used for the drainage of one house with the addition of rain-water from the roof of a bay window, an area, path, or part of the roof of adjoining premises. The discharge of this rain-water from other premises into the drains of a house would only have been permitted under an order of the borough council had the plans submitted to them shown what was contemplated, but having been done without their order or consent, that which should properly be a drain repairable by the owner of the house for which it was provided is converted into a sewer maintainable at the cost of the borough council. For the protection of the ratepayers against the wholesale transformation of drains into unauthorised sewers by the tilting of an eaves gutter or the paving of an area in the wrong direction, it is necessary that the intention to drain any part of premises into the drains of other premises should be clearly and

definitely shown on the plans and sections, and distinctly stated in the particulars which the by-law requires shall be furnished to the sanitary authority before drainage work is commenced, and that where there is no such intention there shall be a definite statement thereof made.

By-law 1 (3).—For the purpose of determining whether the open end of a soil-pipe or ventilating pipe is likely to cause a nuisance at premises adjoining the building to which it is to be attached, an addition to the by-law is necessary requiring that the positions of all windows and other openings into other buildings, and that the height and position of all chimneys belonging to other buildings and within a distance of twenty feet from the open end of the proposed soil-pipe or ventilating pipe, shall be shown on the plans and sections.

By-law 1 (5).—A provision is needed that the scale of the block plan shall be drawn thereon.

By-law 1 (6).—This paragraph would be freed from an ambiguity which has frequently to be explained, if the words "fifteen days at least" were inserted before the words "before commencing the erection of such building." Many persons contend that, so long as the plans, sections, and particulars of proposed work are deposited at any time before the building is commenced, the requirements of this by-law have been fulfilled.

By-law 2.—There has been much controversy respecting the work to which this by-law applies, and arguments have been carried on as to what is partial construction and partial reconstruction. The question as to whether the relaying of pipes to the original lines and gradients is reconstruction, either partial or entire, has been debated many times in every engineer's office; and, as if to vary the monotony of the problem, a refinement has been introduced which enables those who are fond of debate to ask whether if all the pipes of a drain save one be relaid and one new pipe be laid the work is wholly or partially construction or reconstruction. In the case of the Islington Borough Council *v.* Nokes and Nokes, a case resembling this was tried: all the pipes, except one and a gully, of an old drain not on concrete having been taken up and new pipes on concrete substituted, whilst the one pipe and the gully which formed part of the old drain were retained. The Divisional Court held that plans, sections, and particulars of the work must be deposited with the council. Perhaps disputes as to the cases to which this by-law applies would be less frequent if in the second line the words "or relay" were inserted after the words "or alter."

With regard to the second paragraph of this by-law, although plans and sections of repairs are not needed, it is desirable that notice should be

given to the sanitary authority of the intended repairs, and that such repairs should be carried out under the supervision of the authority's officers.

BY-LAWS WITH RESPECT TO W.C.'S.

By-law 1.—The yard, garden, or open space upon which the external walls referred to in this by-law abut, should be such as the owner of the water-closet or earth-closet has a right to obtain light and air from. Many plans are submitted which show that the external walls abut upon the requisite open space, and it is afterwards found that the owner of the water-closet has no right of light and air from the space. Some provision is necessary for the purpose of preventing the construction of water-closets and earth-closets in situations where the open spaces upon which the external walls abut, though of one hundred square feet of superficial area, are extremely narrow, and, in consequence, contribute little to the lighting and ventilation of the closets abutting on them, especially when the spaces are bounded by high buildings.

A question which arises in connection with the construction of water-closets at large buildings, workshops and manufactories, and which is not always satisfactorily settled, concerns the abuttal of an external wall on the open space and the provision of the window and air-brick mentioned in By-law 2. The closets at the buildings referred to are frequently compartments inclosed in a long and narrow building. It is often contended that this building is the water-closet, and that if one of its end walls, in which a window and air-brick as specified in By-law 2 are provided, abuts on an open space of 100 square feet of superficial area, the requirements of By-laws 1 and 2 are complied with. Against this it is urged that *each compartment* is a water-closet, and that one of its walls should abut on the open space and be provided with a window and air-brick. To prevent further question on the subject it would be an advantage if the by-law made it clear that when a water-closet is to consist of more than one compartment, one side at least of each compartment shall be an external wall and shall abut immediately on the street, yard, garden, or open space referred to.

To the direct approaches to a water-closet which are forbidden might be added those from sculleries, wash-houses, and bathrooms. Obvious as it might seem that a scullery was included in the expression "room used for the preparation of food for man," the Islington Borough Council has had to take proceedings in the police court and respond to an appeal, before a direct approach from a scullery to a water-closet in high-class dwellings could be abolished.

In buildings where the lobby, passage, or landing space is limited, and the doors leading to proposed water-closets would be very near to doors communicating with bedrooms, living-rooms, sculleries, bathrooms, wash-houses, workrooms, pantries, food cupboards, or similar apartments, it is desirable that the construction of water-closets in such situat ons should be prohibited, unless ventilation be provided to such lobbies, passages, or landings, to the satisfaction of the sanitary authority.

In addition to direct approaches being forbidden from certain rooms, it is necessary that openings into such rooms and into the interior of any building for the purpose of ventilation be forbidden, for it is not unusual to find air-bricks placed in walls of water-closets abutting on workshops, store-rooms, wash-houses, and internal lobbies and passages.

The provision for solid walls in the second paragraph should be extended to an abuttal on a scullery, wash-house, or bathroom; and in order to prevent the misunderstanding which many persons have with respect to the nature of the *other materials* of which the solid wall or partition referred to may be formed, the words "equally efficient" might be inserted between these words.

The last paragraph of this by-law is evidently an undiscovered mistake, for it cannot have been the intention of the County Council that a water-closet constructed below the surface of the ground and approached directly from a ventilated area or open space should have walls which are not solid and do not extend the entire height from floor to ceiling, though abutting on a room used for the purpose of human habitation, or used for the preparation or storage of food for man, or for any of the purposes enumerated in the first paragraph of the by-law, or that the water-closet should not be provided with a proper door and fastenings. It is necessary that this paragraph be amended by the omission of the words "this by-law" and the substitution of the words "the provisions with regard to an external wall, or walls, abutting immediately upon a street, or upon a yard, or garden, or open space."

By-law 2.—The question of the window and air-brick, already referred to under By-law 1, with respect to several compartments provided with w.c. apparatus and inclosed in a building, would be settled if in this by-law provision were made that when a water-closet or earth-closet is to consist of more than one compartment, a window and an air-brick shall be provided in one of the external walls of each compartment.

The minimum area of the air-brick or shaft to be provided for the constant ventilation of a closet might be stated at, say, 100 square inches net

area, and the position in which they should be placed, viz., in the upper part of the external wall.

Provision might also be made that where the borough council is of opinion that the carrying out of this by-law is impracticable, they may sanction the construction of a water-closet furnished with a window or skylight in the roof of the closet, of the required dimensions and opening directly into the external air, provided they are satisfied that no nuisance would be occasioned by such an arrangement. Closets so constructed should be deemed to comply with the requirements of By-law 1 as to external walls and of By-law 2 as to windows and air-bricks in one of the external walls.

By-law 3.—To prevent the fixing of flimsy flushing cisterns into which water trickles so slowly that the filling is long in being completed, and which are invariably out of order, the by-law might require that flushing cisterns are to be approved by the sanitary authority. Another desirable provision is that the flushing cistern shall be fixed at such a height that the bottom of the cistern shall be not less than 4 feet above the flushing arm of the w.c. pan.

The use of open trough closets, which permit smell from the soil contained therein to traverse each compartment connected with the closet, would be prevented if the by-law prohibited such closets and required the provision of a separate trapped pan to each compartment of a trough closet.

By-law 14.—No provision is made as to the length of the notice to be given by the person intending to construct a closet or to do work connected with the trap, soil-pipe or apparatus, nor is there any requirement that the nature of the proposed work shall be specified, or that work shall be inspected and approved by an officer of the sanitary authority before being covered or closed in. It is important that these omissions should be rectified.

The following additional by-laws are needed:—

1. For prohibiting the placing of w.c.'s in bathrooms.

2. For controlling the mode of constructing the ceilings and floors of w.c.'s, and for making it compulsory that such ceilings and floors shall be made of non-absorbent material.

3. For requiring that w.c.'s should be so constructed, and fitted with such apparatus, that the use of the w.c. shall not be announced throughout the house by sound or smell.

4. For securing the permanency of the open space about a w.c.

BY-LAWS RELATING TO DRAINAGE.

By-law 1, Subsoil drains.—This by-law provides that no subsoil drain shall communicate directly with a sewer, but that a suitable and efficient trap shall be provided between the subsoil drain and the sewer, with a ventilated opening at a point in the line of the subsoil drain as near as practicable to such trap. It does not prohibit the connection of a subsoil drain directly to a drain which conveys sewage, or which communicates directly with a sewage drain; but such a connection should not be allowed, as the foul air from the sewage drain will enter the subsoil drain as readily as that from the sewer. In all three cases the trap is necessary, and it should be placed as near as practicable to the point where the subsoil drain joins the sewer or either of the drains referred to, and should be ventilated directly into the open air. In cases where a stoppage in a soil drain would cause sewage to back up into subsoil drains, it is necessary that the trap be placed in a chamber and provision made for automatically cutting off communication between the sewage drains and the subsoil drain.

By-law 3, Rain-water pipes.—If the discharge of solid or liquid matter from a lavatory into a pipe or channel conveying rain-water from the roof of a building to a sewer is prohibited, it is probably an oversight that the prohibition does not include the discharge of similar matter from a bath.

By-law 4, materials for drains.—According to the first paragraph good sound pipes formed of glazed stoneware, or of cast iron, or of other equally suitable material, need be used only for drains, not being subsoil drains, communicating with a sewer. But it is equally important that the provisions of this paragraph should apply to sewage and rain-water drains which communicate with other similar drains or with a cesspool.

Size of drain.—No drain for conveying sewage may be less than four inches in internal diameter, but there would be no need for branch drains which convey nothing more than the discharge from a sink, lavatory, or bath to be of greater internal diameter than three, or even two inches if they were furnished with convenient means of access for cleaning purposes, and the gulleys communicating with them were so fitted as to prevent the entry of improper materials and were frequently cleansed and flushed; also if the outlet from the sink, lavatory, or bath were covered by a fixed grating. Having regard, however, to the difficulty in preventing the misuse of drains and gulleys, and the apparatus provided for carrying away waste water from houses, the adoption of two-inch drains would be somewhat risky; but a drain used solely for conveying waste water from a sink, bath, or lavatory might safely be made with three-inch pipes.

By-law 8, Ventilating pipes.—In the two methods prescribed for the

ventilation of drains the by-law requires one of the pipes to be carried, vertically, to such a height and in such a position as to afford by means of its open end a safe outlet for foul air, but it does not recognise that foul air may proceed from the open end of the shorter of the two ventilating pipes which are to be provided. It is necessary that the open end of the shorter pipe be placed in such a position and at such a height as to provide a safe outlet for foul air. In all cases it is important that the open end of this pipe should be as far as practicable from any door, window, or other opening into a building, for although the pipe is commonly regarded as a fresh air inlet, and is so marked on many of the plans and sections submitted to a borough council, it often acts as an outlet for foul air, notwithstanding the valve with which the open end is provided.

Size of pipes.—Paragraph 4 requires that ventilating pipes shall have an internal diameter of not less than four inches, and paragraph 6 provides that, under certain conditions, soil-pipes and waste-pipes from slop sinks, if four inches in diameter, shall be deemed to provide the necessary opening for ventilation which would otherwise be obtained by the higher of the two pipes or shafts referred to in paragraph 1. And however large a drain may be in excess of six inches diameter, the requirements of the by-law would be complied with if the ventilating pipes provided in connection with it were four inches in diameter.

It would not be detrimental to the ventilation of drains which did not exceed six inches in diameter if the by-law were amended so as to allow ventilating pipes of three-and-a-half inches internal diameter for such drains; and if soil-pipes and waste-pipes from slop sinks, when three-and-a-half inches in internal diameter, were, under the conditions mentioned in paragraph 6, deemed to provide the necessary opening for ventilation which would otherwise be obtained by the higher of the two pipes or shafts referred to in paragraph 1. It seems unnecessary that at a house drained by a six inch drain which is in communication, either directly or by means of a branch drain, with a soil-pipe or a waste-pipe from a slop sink, three-and-a-half inches diameter, such a pipe, in conjunction with a shorter one of a like diameter near the intercepting trap, should be regarded as not providing an adequate amount of ventilation for the drains of the house, but that in addition to the soil-pipe another pipe of four inches diameter should be fixed.

The by-law should prohibit the connection of a rain-water pipe, or a waste-pipe from a lavatory, bath, or sink (except a slop sink) to a ventilating pipe.

By-law 10, Waste-pipes.—Waste-pipes from baths have been omitted

from the by-law; provision should be made that the requirements with respect to the waste-pipes from lavatories should apply to bath waste-pipes.

Engineers have to deal with many proposals to make waste-pipes from baths, sinks, and lavatories discharge into an open hopper at the top of a main waste-pipe down which the liquids pass to a gully at the foot, and it is difficult to convince those who make such proposals that they are not in accordance with the by-law. It would prevent many discussions if the by-law stated that waste-water from a bath, lavatory, or sink must be conveyed by a continuous pipe directly to a gully, or by a pipe branched into a main waste-pipe in such a manner as to form a continuous pipe from the bath, lavatory, or sink to a gully.

By-law 11, Soil-pipes.—The fourth paragraph omits a prohibition that a soil-pipe shall not be connected with the waste-pipe from a lavatory.

By-law 18, Urinals.—The waste-pipe which the by-law requires shall be provided for a urinal is unnecessarily large for a urinal which consists of not more than two basins or compartments, a pipe of two inches internal diameter being sufficient in such cases.

A requirement should be inserted that adequate means of access are to be provided for the purpose of cleansing waste-pipes connected with urinals.

No provision is made with respect to the flushing of urinals, a most serious omission from the by-law, for the provision of adequate flushing apparatus should be made compulsory.

There are other matters for which by-laws are necessary, viz.:—

1. For describing the construction of, and the method of fixing gullies.

2. For providing that the surfaces adjoining gulleys should be formed and paved so as to prevent the overflow of liquid discharged on the gratings.

3. For dealing with the position and construction of urinals; the traps, pipes, channels and flushing arrangements connected therewith; the construction of the floors, walls and ceilings, and the lighting and ventilation of urinals; and the approaches thereto.

4. For enabling a sanitary authority to fix a time for the completion of work, and so prevent delay and loss of officials' time in making frequent and useless visits to the premises at which it is being carried out.

5. For requiring that notice be given when work is completed and ready for inspection and testing.

6. For preventing the covering of work until it has been inspected and approved by the sanitary authority's officials.

7. For requiring persons responsible for the execution of work to fill with water the portions which are required to stand a water test. Through there being no by-law dealing with this subject, borough councils often have to do the work by their own men and water vans in cases where persons carrying out drainage work are obstinate and refuse to test the work with water.

8. For compelling the uncovering, within a stated time, of work that has been covered before being inspected and approved.

9. For fixing a time within which work found contrary to the by-laws is to be altered and made to comply therewith.

10. For prohibiting the alteration of work originally carried out in conformity with by-laws, in such manner that, when altered, it would be contrary thereto.

11. For prohibiting the carrying out of any work whose effect would be to cause work to be contrary to the by-laws, which, prior to the execution of the new work, was in conformity therewith.

12. For preventing the retention of work carried out contrary to the by-laws since the 14th of June, 1902, unless such work has been carried out with consent of the sanitary authority.

13. For preventing the carrying out of drainage and sanitary work by unqualified persons.

ISAAC YOUNG.

IT is to be assumed at the outset that amendments to the existing by-laws are necessary. The by-laws we are discussing were approved by the Local Government Board on the 14th June, 1901, but the power to make by-laws was vested in the late Metropolitan Board of Works and their successors (the London County Council) by Section 202 of the Metropolis Management Act of 1855. In other words, for thirty-three years the first-named authority, and for thirteen years the London County Council, failed to exercise what I regard as one of their most important obligations. During this long period of nearly fifty years London grew by leaps and bounds, and there being no uniform principle established to guide the architect, engineer, or builder, is it any wonder that they planned and built without any regard to what was right or proper in the drainage of such buildings? I think at times we are inclined to be a little too severe upon the builders, etc., of the Metropolis for the insanitary conditions which it now becomes the duty of our authorities to remove. I

know that during a few years prior to 1901 certain of the vestries and district boards framed regulations dealing with the drainage of buildings, but these were generally lacking in efficiency, and certainly in uniformity. During the years I have named sanitation made great strides, but there was no official seal given, as it were, to mark whether the principles upon which the sanitarian was guided were correct or otherwise. At the end of this period came a code of by-laws, the draft of which had been submitted to, and considered by, the various local authorities, who suggested amendments or otherwise, some of which were accepted and embodied, while others were rejected. The by-laws have now been in operation nearly six years, and have secured during this period not only a fairly uniform mode of procedure but also of practice. To meet the requirements, many of them excellent, manufacturers have done their best, and at the same time the inventive mind has been instrumental in bringing into easy reach of the engineer, of the builder, and the official guardians of the public health, appliances designed to meet the most exacting sanitarian.

Yet I am bound to say that the by-laws have in several respects been tried and found wanting, or, perhaps it would be more correct to say, impracticable of application. I trust that whatever may be the outcome of the discussion, no weakening of the efficacy of the by-laws will result, or lack of uniformity in administering them. Before dealing with several of the by-laws which I consider require amendment, I wish you to bear in mind one important factor which appeared to be lost sight of when the by-laws were framed, that the London Building Act permits an entire site to be covered with a building. Consequently all sanitary appliances must have their drain openings within such buildings, although the by-laws prohibit such openings except in three instances. An excellent provision, but inapplicable in the present state of the law regulating buildings of a certain class.

By-law 1.—This refers to the drainage of the subsoil of the building site. In daily practice it is ignored, as it is only when a person erects a building and himself elects to drain the subsoil that he is required to comply with the by-law. This, however, he cannot do in the specified manner if the site is to be built over entirely. I am aware that the sanitary authority has the power to require plans, etc., of the proposed drainage to be submitted to and approved by it; but it is not known in the majority of cases if the subsoil is of such a character as to require special drainage, and where it is not absolutely necessary, it is very undesirable to provide it, especially upon the lines laid down in the by-laws. These are not sufficiently protective in the trapping of the open-jointed

subsoil drain to prevent considerable pollution of the subsoil in cases where a stoppage occurs in the general system of drainage or through the surcharging of sewers during heavy rains. Several such cases have come under my notice, in which long and serious percolation of sewage matter into the subsoil has taken place. The words "suitable and efficient trap" are not sufficient. If subsoil drainage is necessary the by-law should provide that the trap shall be not only capable of intercepting the subsoil drains, but of preventing the backward flow of sewage matter into them. Moreover, the person intending to build should be definitely required to state in his application to the sanitary authority that the subsoil is or is not of such a character as to require special drainage therefor.

By-law 3.—This is unsatisfactory. It permits a bath waste to be connected to a pipe conveying roof water, but prohibits the connection from a lavatory or sink waste, etc. My opinion and experience is that it is less unwise to connect a lavatory and certain classes of sink waste pipes thereto than it is a bath waste. A lavatory basin is generally used by persons in good health, and a sink may be used for photographic, chemical, or other harmless purposes. On the contrary, the bath may be (and frequently is) used by patients in the desquamating stage of scarlet fever or other infectious disease, so that more harm is likely to arise in such a case than would result from the waste waters I have named as passing from a lavatory basin and certain sinks.

By-law 4.—This applies to and regulates the concreting of both iron and stoneware drains. In my opinion, it should be amended and, excepting where drains are laid for the exclusive conveyance of subsoil water, should require that all stoneware drains, situated either within or without the building, shall be surrounded with portland cement concrete at least 6″ in thickness in every part thereof. I find that drains laid outside buildings are more liable to damage than those situated within the building, yet the first named are only required to be laid upon a bed of concrete and encased to the extent of not less than half their diameter. On the other hand, to lay upon or embed iron drains in concrete is both unnecessary, undesirable, and a waste of money, excepting where they must necessarily be laid near the surface of the ground over which passes heavy traffic.

I am distinctly of opinion that the use of iron drain-pipes is unsuitable for the conveyance of rain or sub-soil water. Where they are so used, I have found that the destruction by oxidation of the pipes is rapid, and the more so where the carriage of such waters is of a very intermittent

character. On the other hand, I am of opinion that iron pipes exclusively should be used for the drainage of soil and greasy wastes where such drains must of necessity pass through or beneath a building. It is unnecessary to state all the reasons that might be brought forward in support of this. One fact alone, I think, justifies my contention, the fewer joints necessary in the construction of an iron drain than are required for stoneware drains. In any drainage system the joints constitute the weakest link in the chain, and the less they are in number the more permanently secure the drain.

I have previously stated that iron drains should not be required to be laid upon or imbedded in concrete. All that is necessary is proper support in the nature of piers of concrete, brickwork or flags, at suitable distances apart. If these are provided, and care taken that lime, foul earth, and chemical refuse is not laid in contact with the iron pipes, the life of such drains will be more prolonged than if surrounded with concrete, excepting as I have before stated to preserve them from damage. Wherever possible, they should be carried upon piers or brackets, etc., in passing through cellars, basements, etc., and the by-laws should be amended so as to encourage this method of construction.

Respecting the composition of concrete, as specified in the by-laws, I have no hesitation in condemning it in unqualified terms. The by-law is too indefinite, affording to the cheap and nasty builder too much latitude, and placing him at a financial advantage over the more honest builder. In fact, this remark applies to many of the by-laws, but more particularly to that relating to the composition of concrete. From experience I strongly advise, not only the elimination of the words "other suitable ballast," but an entire amendment of the by-law, so as to secure uniformity and the use of specified materials only. What shall be deemed other suitable ballast constantly leads to difficulty. The inspecting officer finds a mixture of two or more of the following substances, in sizes varying from a brickbat or large flint to a small piece of drain-pipe, etc.: Thames ballast, pit or burnt clay, clinker and breeze well or badly burnt, loamy sand, road sweepings, broken drain-pipes, etc. Small quantities of these materials, it may be argued, are not objectionable, but where to draw the line is the source of trouble. Furthermore, the present admixture of eight parts of material to one of cement is not a suitable concrete composition for drains. I therefore strongly urge the following, or an equally good and clearly defined composition, thereby leaving no loophole, nor placing the inspecting officer in the invidious position he now occupies: concrete shall be composed of four parts of Thames or clean pit ballast

passed through a $1\frac{1}{4}''$ mesh, two parts of clean sharp sand to one part of Portland cement, the whole to be thoroughly and uniformly mixed together previously to water being added.

By-law 5, Interception from Sewer.—Upon the wisdom of this by-law there is considerable divergence of opinion, but from the official standpoint I am under the impression that the greatest opponents to the intercepting trap, and who advocate most strongly its abolition, are a few engineers and surveyors, who, exercised in their own minds as to how best to remove the frequent complaints from residents relative to the escape of sewer gas from surface ventilating gratings, are anxious to secure the effective ventilation of the sewers under their control at the expense of the drains of dwelling houses, etc.

I will at once admit that I have been a consistent advocate of efficient intercepting traps. Sewers are vested in the sanitary authority, and the duty of the latter is to see that they are constructed, flushed, and effectively ventilated, not shirking their responsibility at the expense of the owner of private property. His duty is the provision, maintenance, and efficiency of the drainage of his property; and having discharged this so as to protect the health of the occupiers, he has, in my opinion, done all that should be required of him. I could, if time permitted, give many instances where I have proved the value of the intercepting trap, but no better argument can be adduced in support of it than the experiments carried out by Major Horrocks at Gibraltar, and published in the May number of the Journal of the Institute. No. 2 of his conclusions reads: "A disconnecting trap undoubtedly prevents the passage of bacteria, present in the air of a sewer, into the house drainage system." The opponents will allege that the intercepting trap causes obstruction to the flow of sewage through the house drain and that stoppages ensue. But my experience is probably that of the majority of those present, viz., that such obstructions arise from one of several causes, such as for instance:—

(*a*) an unsuitable trap;
(*b*) the trap improperly fixed;
(*c*) the drain too large to efficiently flush the trap;
(*d*) material foreign to a drain carelessly or purposely passed into it.

I sincerely trust that this meeting will give a unanimous expression of opinion in favour of the retention of the by-law requiring interception from sewers. Amend it by all means, specifying water seal, difference in level of inlet and outlet, maximum quantity of water the trap shall contain when at rest for the purpose of trapping, etc.

By-law 6, Means of Access.—This by-law would appear to have been framed upon the model by-law of the Local Government Board. But in practice it is found that neither the model by-law nor By-law 8, which is superfluously worded, is altogether suitable for application in London. I am aware that Clause C of the by-law provides an alternative to Clauses A and B by stating that "if in any case the two preceding arrangements are undesirable," both ventilating shafts shall be carried up to such heights, etc., as to afford a safe outlet for foul air, but in nearly every case where ventilation to drains is provided, it is found that A and B provisions are undesirable, but have to be allowed. A false sense of security is given by fixing a mica-valve to the low-level ventilating pipe. It may be temporarily effective in preventing the escape of foul air. Temporarily I say advisedly, for its effectiveness may vary from forty-six hours to six months, but not longer. The by-law should be amended specifying a minimum distance from a dwelling house, etc., in which the low-level ventilating pipe may be provided; and in estimating this, it should be with a view to the end being left quite open, excepting for the provision of a wire protection. What is really necessary, in my opinion, is to induce sanitary authorities to insist, as far as possible, that all drains shall be laid clear of buildings, either in combination or otherwise. More perfect drainage, from every point of view, can be secured by such an arrangement. The main argument against sanctioning combined systems is that it affects leasehold interests; but if it were insisted upon, I have no doubt that the several interests could be safeguarded in the drafting of leases in so far as the common or main drain is concerned. In any case, if the clauses respecting ventilation are to stand, I should prefer to see Clause C placed first, and the alternative to this provision to be A and B in any cases in which the latter arrangements can be safely carried out.

By-law 9.—I have incidentally referred to this in my opening remarks, wherein I drew attention to the fact that where entire sites are built over the requirements of this by-law cannot be carried out. In many cases also, where the entire site is not covered, it is found impracticable of application.

By-law 11.—"Soil pipes inside buildings must be of lead." Daily instances occur in which it would be better to have the soil pipe of iron inside certain buildings, and I think a discretionary power might here be given to the sanitary authority to permit iron pipes in any case wherein the authority considered such to be preferable.

By-laws 12 to 16 (inclusive) relative to the jointing of pipes, traps,

etc., are unnecessarily long, and in great measure repeat themselves. One by-law should be made dealing with the jointings of all pipes. It should be drafted in a simple and practical manner, somewhat as follows:

> All lead pipes, traps, etc., and brass or copper connections thereto shall be jointed with properly-wiped plumbers' joints, excepting where expansion joints are necessary. All iron pipes, traps, etc., and brass or other metal fittings connecting thereto shall be made with molten lead properly caulked, excepting where expansion joints are used. All stoneware pipes and fittings to be jointed with neat Portland cement, including connections thereto from iron, brass, and other fittings, excepting lead. All connections from lead to iron, stoneware, or other pottery ware, to be furnished with a proper brass ferrule or thimble, and the jointing thereof to be as specified in the preceding by-law.

The words "equally suitable and efficient manner" should be deleted from the several by-laws as not tending to secure either efficiency or uniformity in practice. Provision is made in By-law 11 for iron pipes with flange joints for use as soil pipes. The by-law might with advantage be extended to iron drains. Many cases have come under my notice wherein considerable vibration taking place (either from passing trains, as in railway drainage or in buildings in close proximity, and also where heavy machinery exists, as in factories, etc.), stoneware and iron drains have been fractured, owing to the extreme rigidity of the ordinary jointing material; telescopic or flanged joints with rubber or asbestos insertions, properly bolted together, being the only remedy in such cases as I have quoted.

By-laws 17 and 18 require amending in the direction of precautions being taken against the siphonage of traps in w.c's., etc., wherein two or more enter a soil pipe, whether such w.c.'s are above each other or on the same level. The inference is now frequently drawn (and the by-laws, in my opinion, justify such an inference) that precautions against the unsealing of traps are to be taken only when such traps are one above the other.

There are many other points which are worthy of attention had time permitted. In the amendment of the by-laws very careful consideration is necessary. The wording should be simple and concise, but convey a practical meaning; the first object of the by-laws should be efficiency, the second uniformity.

MR. ERNEST VAN PUTTEN (Lewisham) sent the following communication:—The by-law which, in my opinion, requires amendment most urgently is No. 5, which provides for an intercepting trap on house drains. Perhaps instead of

amendment I should say abolition, as I am persuaded that interceptors are not only useless, but a great evil both to the house drains and the sewers. In 1893 (Vol. XIV., page 237), the Institute carried out a series of over 800 experiments with channel pipes so that actual observations could be taken. The result showed that with a two-gallons flush, a considerable percentage of solids was left in the drain and intercepting trap. So far as the solid matter left in the drain is concerned, this remains uncovered by water, when it gives off far more smell than ordinary sewage, which is in a sewer and is carried along in water. The solids remaining in the interceptor are of course in water, but remain many hours because, although the closet may be used again, it frequently happens that the next discharge from the closet will move on only a part of the solid left in the interceptor by the previous user. The sink and bath wastes, as a rule, do not move any solid out of the interceptor, as they do not come with a sufficient velocity and volume. For these reasons I suggest that the air in house drains is very foul. Now, as to sewers. In every well-regulated borough (and I assume all London boroughs are well regulated) the sewers are periodically cleansed and flushed, but I have never heard of anyone who regularly cleanses drains. By degrees any sewers which are found to be irregular in fall or faulty in any respect are relaid. The solid sewage is always covered with water, the flow being continuous instead of intermittent as in house drains. I therefore contend that the air in sewers, if free ventilation is permitted, is better than in house drains. The bogey of sewer air poisoning the air of house drains is to my mind exploded. There is often an argument used against the ventilation of the sewers through house drains something to this effect: "The sewers belong to the borough, the house drains to the private owner, so why should he ventilate what it is the duty of the borough to look after." This is childish; does not the private owner also own the sewers? The borough is only the collection of all individuals into one body. The abolition of the interceptor would improve the ventilation of both the sewers and the drains, the ventilators on the soil-pipes which now have to be carried clear of all windows and chimneys would mostly act as outlets, and the surface gratings in the roads as inlets; these gratings in the roads should be placed at much less distance apart than at present, say 200 ft. for a maximum. The so-called fresh air inlet often placed close to the front door or under the front sitting-room window could then be abolished. This misnamed appliance, which is fitted with a mica flap (which does not work for more than six months after it is fixed) is more often than not the foul air outlet. Another argument often raised in favour of the interceptor is that if the drains are faulty the sewer air may escape into the house. Now the by-law, the abolition of which I suggest, only makes it compulsory to fix an interceptor on a new drain or on one which is being reconstructed, so that it may fairly be assumed that in these cases the drains will not be faulty; and as all drains under houses have to be encased in concrete, it is most improbable,

even impossible, that with a free course for the air from the sewer through the drain to the top of the ventilating pipe, that air could find its way through a crack caused by a settlement in the ground. Should such a thing occur the sewage would leak through, in a porous soil, and cause a smell long before any harm could be done by an escape of sewer air. If it were the custom when house drains are found to be faulty to fix an interceptor so as to block off the sewer air, leaving the house drains defective, there might be some justification for the interceptor; but as the interceptor is only fixed on new drains, presumably perfect, I cannot see the object of using them. Interceptors are the most frequent cause of stopped drains.

MR. J. W. WRIGHT CLARKE (Wandsworth) said, as a lecturer on sanitation, he had great difficulty in explaining some parts of the working of the by-laws. Referring to the papers that had been read, the speaker thanked Mr. Isaac Young, especially for his reference to covering iron drains with concrete. He had a strong feeling on the subject, because in a case of one of his own houses being redrained, he objected to any concrete being placed over the iron drains, and had appealed to the county council for their opinion as to the meaning of a certain section of the by-laws on the subject, but without effect. He also thanked Dr. Louis Parkes for his reference to the evils of open hopper heads (especially in residential flats) for receiving waste-water from sanitary fittings fixed on various floors. Many times he had found it necessary to send men to put covers on the heads to prevent any odours escaping and passing through adjoining open windows. The odour from a cabbage, or a fish, boiled in the kitchen of one flat would be noticeable in all the adjoining flats. Wash-basins with waste-pipe attachments should never be allowed in sleeping-rooms. Irrespective of the watery vapour escaping from the hot water into the room and causing dampness, there were the odours from the basins and waste-pipes. These odours were aggravated by a common practice amongst servants of emptying the contents of the chamber utensils into the basins. Even in private houses such an arrangement was insanitary, and, in the speaker's opinion, a by-law should be made to deal with the matter; and where such basins are desired, they should be in a dressing-room or other convenient position outside the bedroom. Referring to Mr. Isaac Young's remarks as to by-law No. 11, which deals with soil-pipes, the speaker did not notice any mention of the advantages of fixing soil-pipes inside buildings. When fixed inside, the pipes should be in sanitary wings, and not be carried through living rooms and other unsuitable places. Water and gas-pipes are fixed inside, and why architects should be compelled to have the walls of their buildings weakened and mutilated by perforations made for the branch soil and vent pipes to pass through, and the outside faces of their buildings disfigured by unsightly pipes, is difficult to appreciate. The by-law is much too drastic. In cottage property, and in small

houses generally, the outside position is undoubtedly the best. But for high-class mansions where the sanitary work is supervised by an architect, or by an expert engineer, the imperative "shall" in the by-law should be modified. In a certain section of crown property, soil-pipes are forbidden to be fixed outside the mansions or buildings. Dealing with clause 6, the speaker contended that drainage manholes should be water-tight up to the level to which it is possible for the sewage to fill. But for a manhole which is 9, 10, or more feet deep, and which could not possibly be filled with sewage to a greater depth than 2 ft. 6 in., it is out of all reason for an official to order the walls to be rendered inside with cement up to the ground level. The clause should be more explicit, and not ask for something on which money would be spent without any corresponding advantage being gained. In any proposed revision of the L.C.C. drainage by-laws, all the points raised by the readers of the papers, and those dealt with in the after discussion, should be duly considered. Clear, descriptive by-laws would enable the whole of the official sanitary world to work on common accepted lines, instead of on the diverging lines which are now in vogue. In addition, the ordinary citizen would be able to glean from them the special duties he owes, not only to himself and family, but also to his neighbour and to the community generally. Finally, greater progress in the sanitary conditions of dwellings would be made if those for whose guidance sanitary by-laws are drawn up, the official and the lay sections of society, clearly understood their respective duties.

Mr. Fredk. J. Osborne Smith (Westminster) pointed out that the by-laws provided that iron drains, either inside or outside a building, should be laid on a bed of concrete. This seemed unnecessary. A pier at the back of each socket and one in the middle of each 9-ft. length would give ample support under most conditions. The suggestion to give preference to carrying both outlet and inlet ventilators of the house drain to above the roof did not appeal to him, as he had proved by practice that the result was far from satisfactory. Except under certain conditions, and then only for a very short period, did the low open end act as an outlet. Puffs off waste pipes almost invariably acted as inlets, rarely as outlets. That the waste-pipes should be carried up away from windows was admittedly an improvement on the "head" system, but junctions would often modify the trouble caused, if used instead of heads. Puff pipes, however, must not be so treated, because waste-pipes are liable to become frozen in consequence of a leaking tap, and then the puff pipe, if fixed just below the top of the fitting, acts as an overflow and prevents flooding. *Bath waste-pipes* should, however, whenever possible, discharge into covered ventilated gullies, so that the foul air from them should not be blown into doors and windows near. Channels from waste-pipes to gullies should be prohibited; they were always foul, and in opposition to the self-

cleansing principle of sanitation. Grease traps, also, for the same reason, were most objectionable, and were not effective without constant attention, which they rarely got. A "safe outlet" for a ventilating pipe should be defined. It was suggested in the by-laws relating to the depositing of plans that 20 ft. from a window or opening, etc., might be regarded as an extreme distance, as no opening beyond was required to be shown on the elevations submitted. Equally well a gully might be defined, rather than leaving it to be "properly trapped." "Proper" was a very vague term; so was "suitable." What was a suitable fall? Why not schedule the falls according to the size of the drain and also the amount of water that would pass through them. Because a larger pipe had less fall it was not to be assumed that the lack of fall in a small drain would be adjusted by using a larger sized drain-pipe. By-law 7 seemed to prohibit the use of branch channels discharging over the half-round channel of the main drain; this was surely not intended. Would it not be well to define that a waste-pipe or rainwater-pipe ended at the gully into which it discharged, so that the regulations relating to drains should come into operation at the gully? He was not aware that it was suggested to prohibit the placing of a soil-pipe inside a building; but he would like to emphasise the folly in some instances of compelling the use of lead pipes, inside, when heavy cast-iron soil-pipes, with blue lead joints, would be infinitely superior and less liable to damage. It was curious to note that if a w.c. were entered from an area, that area must be at least 40 ft. super.; but one entered from the inside of the building must be ventilated into an area of at least 100 ft. super. Why should one w.c. require more air space than another?

MR. W. GREEN (Finsbury) said he was glad to find that an effort was being made to discontinue the fixing of hopper heads on sink and bath-waste down pipes. He had seen them in a sharp frost with icicles hanging from them five or six feet long. In his opinion soil-pipes, now that we had heavy iron and lead prescribed by the by-laws, might safely be carried up inside buildings, as outside soil-pipes were not always satisfactory; and he instanced an experience of a few years back, when the outside soil-pipes of large buildings were frozen in some cases as high as the second and third floors, with the result that when the people on the floors above emptied their slop-pails, etc., the excreta overflowed through those water-closets on the floors below, but above where the soil-pipes were frozen, and ran all about the corridors, thereby creating an intolerable nuisance. At one large block of artisans' dwellings sixteen to twenty coke fires were kept alight at the bottom of soil-pipes for several days and nights; first, to endeavour to thaw them and then to keep them from freezing again. And this notwithstanding that the soil-pipes consisted of very heavy iron. He was very pleased to be present at that meeting for the reason that hopper heads were being condemned as they had been. That was a sign of the times and could be

taken as an encouragement to those who desired to see the practice of fixing interceptor traps on drains discontinued. Mr. Young, in his paper, had said that the private owner had his own drain to look after and ventilate, and it was the duty of the sanitary authority to ventilate the sewer; but the speaker would like to know who would pay for ventilating the sewer if the sanitary authority did the work, unless it was the owners and occupiers of the several houses, as the sanitary authority had no money but what they got from the rates. Therefore it would not only be more efficient to ventilate direct, but also a great deal cheaper. The by-law relating to the construction of water-closets abutting on a room used as a human habitation, for storage of food, or as a workplace, etc., needed alteration, as under the present by-law it was possible to make the partition of nearly anything, it being so difficult to know what was meant by the words "or other material" which followed the requirement that the partition should be constructed as a solid wall or partition built of brick. In his opinion, a minimum thickness for these walls or partitions should be inserted in the by-laws.

Mr. H. Alfred Roechling (Westminster) said, concerning the disconnecting trap which had been mentioned in a somewhat deprecatory manner by one of the previous speakers, he thought they should consider it on its merits only. He had discussed this subject before this Institute in February, 1906, and taking stock of what had occurred since that meeting, he was of opinion that nothing had happened to make him alter the views then expressed; but, on the contrary, the very careful experiments recently made by Major W. H. Horrocks (an abstract of which was printed in the Journal of the Institute for the month of May) confirmed the great importance of this trap, and that they should therefore not abandon it except under very special circumstances. It was further a very interesting fact that, whereas at the meeting in February of last year the readers of the papers were against the disconnecting trap, the readers of the papers to-night were all in favour of it, which view was definitely expressed in two papers and to be inferred from the third. One of the previous speakers had suggested that soil-pipes should be allowed to be fixed internally, but he was anxious that it should not go forth from this meeting that the Institute was in favour of such a course. There were exceptional cases in which an internal soil-pipe might have to be adopted, but generally speaking he saw no areson why the external soil-pipe should be abandoned. Some time ago, when advising abroad, he was faced with the same proposition, and he was then shown a soil-pipe made of wood 12 inches square. It was pointed out that this soil-pipe, which was fixed externally, always froze up in the winter, and when he (the speaker) had it examined, it was found to be coated with filth. It was clear, therefore, that such a soil-pipe must freeze up. But a soil-pipe properly designed, properly constructed, and properly maintained, should not contain any

filth, and should only serve for the passage of fæcal matters to the drain. If the soil-pipe contained no solid matters it could not freeze up. In this country, at any rate, there was no need, on account of the climatic conditions, to fix the soil-pipe internally, and the great advantage of an external soil-pipe was that no smells from it would accidentally spread throughout the house. With these few remarks he would conclude his observations, hoping to be able to supplement them on a future occasion.

MR. DAVID GRUNDY (Westminster) said that the first point to which he wished to refer was that part of Mr. Patten Barber's suggestions to be found on page 233, by-law 3. While partially agreeing with the first portion of his remarks, he was opposed to the closing paragraph. Such a hard and fast rule would exclude the most efficient systems. The height of the flushing cistern was a secondary matter, and by far the greater portion of the first two papers, and the whole of the remarks following thereon, had been directed to matters of minor importance; not that they should be ignored, but the chief point to be attained was that of efficiency in the appliance to be used. Another point to which he took strong exception was the expression of "best work." Nothing ought to be considered of too great a value in connection with sanitary fittings. The ideal object of sanitarians was to secure that all dwellings should be protected from offensive smells. The suggestion that the sanitary inspector should certify the efficiency of the flushing cistern was an excellent one. Time in filling was a most important matter. No system ought to be certified or fixed which required more than thirty seconds to supply two gallons of water to the flushing cistern, even when fixed in ranges of ten or more. It is assumed that offensive smells must of necessity be associated with the water closet, hence Mr. Patten Barber's plea for free ventilation. If the cause be removed, the ventilation would be a secondary matter. A perfect flushing system will keep the apartment free from the usual lingering smells. The sanitary authority should be able to prevent the installation of fittings not equal to the standard efficiency, in all properties, because from these fittings arise great danger to health. When the cost of a building has to be reduced, the first item to receive attention is the closet; it is at best the least considered, and very often the most flimsy fitting in the structure. So long as a water closet is provided, "its efficiency" is of little or no concern. A further question demanding attention was that in nearly the whole of the metropolitan water area flushing cisterns were being supplied through the same pipes which supply the domestic water, as well as the water to the bath, lavatory basins, and hot-water boiler. It was a most dangerous practice, and one trembled at what the far-reaching results might be. Further, no ball valve or stop cock gave the slightest protection to return flow or contamination; although so far back as 1852 a Parliamentary Act provided that neither of the latter should be allowed.

These were points which had been passed over in favor of the ventilation of the closet, and the waste discharges from bath and lavatory basins, which are minor matters. He thought the discharges of waste should be above the gully grid. He was opposed to their being sealed and treated as soil-pipes. His chief objection was that neither from the sink, lavatory, or bath, could dangerous or offensive gas enter the domicile through the waste-pipes as now fixed. It was correct to say that in good houses they were not so frequently used as the water closet, they were even less used in dwellings occupied by artisans and the middle class, but the risk of the gases penetrating the sealed trap, or that becoming dry, was extremely small. Would it be so if they were fixed in the way now suggested? Let them by all means obtain power for protection, and insist upon their authority being obeyed to the smallest detail before certifying a building as sanitary; also have provision in the by-laws giving the sanitary inspector controlling power over sanitary fittings, even after they had been fixed, if they did not reach the above-stated standard of efficiency. The intercepting trap, when properly constructed and fixed, he hoped had come to stay. No doubt many of them had found some of these blocked. If, however, the excreta was cleared from the water closet with the first puff or fall of water (on its being released for flushing), the two gallons would drive it in front and clear the interceptor trap each time. The stoppages found in intercepting traps arose from two causes. First, want of a sufficiency of water to carry the seal of the trap with each flush; this was the reason why three or more gallons of water was advocated, but which gave little if any better results; with a properly constructed apparatus two gallons had been proved sufficient. Second, the trap itself had been either badly fixed or was faulty in construction. Fresh air inlets, as at present fixed, were, in his opinion, dangerous to health; seven out of ten of these were simply open outlets for sewer gas. They ought either to be dispensed with, or some other principle employed, combined with the flap (mica or otherwise) valve. These, like flood gates at sewer outfalls, were never gas- or watertight after they had been fixed a short period.

The Discussion was adjourned, and will be continued at a meeting to be held after the recess.

THE MEDICAL INSPECTION OF SCHOOL CHILDREN.

By H. MEREDITH RICHARDS, M.D.,
Medical Officer of Health, Croydon.
(FELLOW.)

WHEN asked to address this Association,* it seemed to me that I might with advantage direct your attention to school hygiene, and especially to those problems of school hygiene with which women health workers are already or will, in the near future, be brought into contact. I have therefore chosen as my subject the Medical Inspection of School Children.

Did time permit it would not be without interest to recount the various stages by which the suggested medical supervision of school children has, in a comparatively short time, come definitely within the field of practical politics. In doing so we should find that the present position is due, in part to the enthusiasm of a few public health workers in this country, in part to appreciation of the work done by German and American school doctors, and, in a still larger part, perhaps, to the reports of the Royal Commission on Physical Training (Scotland) and the Committee on Physical Deterioration. To these reports and to that of the Departmental Committee on Medical Inspection and Feeding of Children, I would refer you for much useful information.

Logically, medical inspection is really a natural corollary to the Education Act of 1870. As soon as school attendance became compulsory, certain medical problems had immediately to be faced. As far as concerns the physical condition of the individual children, these were mainly (1) the exclusion of children suffering from or likely to convey communicable disease; (2) the exclusion or partial exemption from attendance of children unfit to attend school without risk to themselves.

Even within these narrow limits, the medical supervision of schools is a somewhat more complicated problem than is commonly supposed. As

* The address was delivered before the Association of Women Health Workers.

far as communicable diseases are concerned, public health authorities at first limited their efforts to what are now known as the notifiable diseases, viz., scarlet fever, diphtheria, enteric fever, and smallpox. Efforts to cope with diphtheria and scarlet fever were for the most part limited to the exclusion of children obviously suffering from the disease, and to wholesale school closure when there was anything like an epidemic. Experience soon showed that the plan of attack must be a little less elementary, and that school closure is for the most part an expression of failure to control an epidemic. Let us see what has to be done when diphtheria attacks an elementary school child. As soon as isolation of the patient has been arranged, a notice is dispatched to the school that all children from the infected house are to be excluded from school until receipt of a further notice. During this period of quarantine the family is kept under supervision, and every child is examined bacteriologically at intervals until negative results have been obtained on two successive occasions. Material for such examinations is sometimes forwarded to the borough laboratory by the medical attendant whose assistance is always solicited, but in the majority of instances the throats are swabbed by one of the health visitors.

In the meantime, the receipt of the notification has directed the attention of the teacher to the occurrence of diphtheria. Special attention is thereby directed to "sore throat," nasal discharge, enlarged glands or so-called "mumps," among classmates. All such cases have to be excluded from school, and reported to the medical officer and to the parents on appropriate forms.

As soon as the medical officer receives this notification of suspected illness, preliminary inquiries are made by the health visitor into the circumstances, and swabs are taken unless medical advice has already been sought. Should there be no medical man in attendance, parents are urged to get medical advice.

On the facts so ascertained, and on the laboratory report and on the advice of the medical attendant, the medical officer bases his opinion as to the exclusion or non-exclusion from school of the children in question.

Similar inquiries are at all times made on the occurrence of "sore throat," though they are more searching when diphtheria is known to be prevalent in the school or district.

Should diphtheria attack two children in the same class the medical officer immediately visits the school, examines all the children in the infected class, gets a list of absentees, and directs the health visitors to

visit the homes, ascertain the alleged cause of illness and the name of the medical attendant, and forward any necessary swabs to the borough laboratory.

Mutatis mutandis similar measures are adopted in the case of other diseases. It will be seen from the instance just quoted that measures adapted to the natural history of a disease like diphtheria require a fairly complete organisation, wherein the intelligent assistance of trained health workers, acting under direct medical supervision, plays an important part.

In the case of non-notifiable diseases, such as whooping-cough and measles, the co-operation of teachers and health workers is, perhaps, of still greater importance. Certainly, as far as mortality rates are concerned, measles and whooping-cough are of greater moment than scarlet fever and diphtheria. Thus in Croydon, during the last ten years, the average number of deaths from measles and whooping-cough has been 46 as compared with 29 for scarlet fever and diphtheria.

As far as measles is concerned, it must be confessed that attempts to prevent spread among elementary school children are not very successful, and it seems likely that we have most to hope from measures designed to avert a fatal issue among children attacked. Death from measles is almost unknown among the children of the affluent. Thus in Croydon, during the last five years, 176 deaths from measles occurred among the children of artizans, while only 3 deaths were registered among the children of the non-artizan class. At the present moment I am endeavouring to carry this investigation further and ascertain how this is brought about. In the main I have little doubt that it is a question of domestic and personal hygiene, and that the control of fatal measles depends on steady spade work in this direction: another field of activity for the health worker.

Considerable attention has been paid in many towns to verminous conditions. In the average town school more than half the girls and rather less than half the boys have live stock on their scalps. To deal with this complaint, teachers are furnished with cards which have been slightly altered from those drawn up by Dr. Kerr for the L.C.C. schools. The first card is given to every parent when the child enters the school, and enjoins the necessity of attention to the hair. The next card suggests treatment when a child's head has been found to be unclean; and the third card contains a warning as to the consequences of neglect. To insure success this method has to be supplemented by periodic inspection of each child's head by a school nurse, and an occasional prosecution at the instance of the school attendance committee or of the N.S.P.C.C. of

negligent parents. Unfortunately, it is difficult to convince some magistrates of the very grave importance of uncleanliness in its effect on the self-respect of the child, and of the great hardship involved in compelling careful parents to send their children to schools where the children are not thoroughly clean.

Ringworm, too, is another school scourge in London and the neighbourhood. For its detection we depend partly on the parents and teachers, and partly on routine examination by the school nurse.

The control of communicable disease alone entails considerable work. Thus in Croydon, with a population of 151,000 and 22,000 elementary school children during 1906, though there was no special epidemic, 3,500 cases of illness were reported to the schools by the medical department, and over 7,500 home visits were made by the health visitors while investigating cases reported from the schools. When we add to this the many hundreds of bacteriological examinations for school purposes made at the borough laboratory, and the frequent school visits and inspections of the medical officer in reference to infectious cases, it will be admitted that the supervision of elementary school children cannot be undertaken without the assistance of a properly co-ordinated medical department in which medical officers, bacteriologists, health workers, and school teachers all work towards a common end.

Many towns have also made arrangements for examining the sight of school children, and for the detection and special instruction of deaf and other physically and mentally defective children.

Truants have also to be certified before admission to special schools, and children alleged to be unfit for school attendance are frequently the subject of special medical reports.

So far, however, we have only dealt with the fringe of the question. The performance by local authorities of their more obvious duties in relation to the communicable diseases soon called attention to certain large and, in my opinion, even more important problems.

In England and Wales about six and a quarter million, or about one in six of the total population, are attending public elementary schools. In other words, one in six of the population passes a considerable portion of each day under conditions for which the State is directly responsible. The importance of securing healthy school buildings is therefore obvious and need not now be laboured, though there is still need for steady pressure to be directed towards this end. Equally obvious is the invaluable opportunity afforded by school attendance for inculcating the primary laws of health on the next generation. Though much has yet to be done,

and efforts are only beginning to be consciously directed to this end, no one who has any intimate knowledge of school children can fail to recognise the immense indirect advantage that compulsory school attendance has already secured by raising the parental standard of personal care of their children.

Now, while this is fully recognised, certain other developments have directed both professional and popular attention to the necessity of more definite medical supervision of school children. In the first place, not only has there been a gradual extension of the list of communicable diseases, but public health administrators are at last fully alive to the fact that many diseases may be dangerous and *preventable* even though not infectious; and conversely, that the ravages of certain communicable diseases may be efficiently checked by measures calculated rather to raise the resistance of the individual than to lower the vitality of the germ. Again, the work already undertaken in connection with schools had directed attention to the large number of children suffering from physical disabilities of one kind or other. This was emphasised by the evidence given before the Committee on Physical Deterioration, and has been given so much prominence during the last four years that, when the Education Bill of 1906 was before Parliament, an amendment in favour of general medical inspection of school children met with the approval of all parties of both houses. Though this Education Bill was rejected, a short Bill embodying the like provision has passed the committee stage of the Commons during the present session. The Bill contains the following enactment:—

> The powers and duties of a Local Education Authority under Part III. of the Education Act, 1902, shall include—
>
> (*b*) The duty to provide for the medical inspection of children before or at the time of their admission to a public elementary school, and on such other occasions as the Board of Education direct, and the power to make such arrangements as may be sanctioned by the Board of Education for attending to the health and physical condition of the children educated in public elementary schools.

There can be little doubt that this section or something like it will shortly become law. Medical supervision of all elementary school children will then become obligatory, and it is to the practice of medical inspection that I now want to direct your attention, as it is only by enlisting the sympathy and co-operation of all health workers that the best results can be achieved.

Though I cannot conceive that medical inspection will produce results commensurate with the time and money involved, *unless it is carefully*

co-ordinated with other public health work, I do not intend on this occasion to discuss the necessary central or local organization. My own opinions have been frankly stated elsewhere, and I would ask you to concentrate your attention this evening on other issues, and more particularly on methods and results. During the last couple of years the method to be adopted has occupied a fair share of my spare time, and the conclusions which I have reached are the result of tentative experiments in Croydon schools, and are naturally subject to revision as one's experience increases and comparison can be made with methods evolved in other towns. In this connection one may be permitted to note how much we all owe to the stimulating example of the medical department of the London County Council, and to the illuminating reports that their officers have compiled during recent years.

In the first place we must start with a definite idea of our objective. According to some it is merely a sort of annual stocktaking, whereby the physical condition of school children in various districts and at various intervals of time can be accurately compared. Though an anthropometric survey of this kind would not be valueless, it would certainly not appeal to the average member of a local authority. Again, if elaborate physical measurements were taken of *all* school children, either the available energy of the scientific staff would all be spent in analysing the results, or the records would be so much dry rubbish which would ultimately find its way to the local destructor. On the other hand, the careful measurement of a limited number of representative children would not unduly tax the staff, and would in a few years furnish ample material for the sociologist and enquirers into physical deterioration. I think you will agree that the collection of such data is not the primary object of medical inspection but something more practical, namely, the detection of those children who are suffering from definite disease or are below the normal standard of health, and the discovery of any abnormal school, home, or personal conditions to which such defects may reasonably be ascribed. To do this the child, the medical inspector, parent, and teacher must be brought in relation with one another.

The sort of routine examination which, it seems to me, will meet the case is being tentatively tried in one large school in Croydon, and will be understood from the cards on which the results of the examinations are recorded. In drafting them, I have freely made use of the schedules drawn out by Dr. Leslie Mackenzie and those in use in certain German schools, and have also had the advantage of the criticisms and suggestions of Dr. C. J. Thomas. Of course, certain children will require a more

elaborate examination, for which a blank supplementary card can easily be adopted.

For obvious reasons, it will be convenient to use the card index system whenever possible.

Those used in Croydon measure 8 ins. by 6 ins., and are here reproduced. Different colours are used to distinguish the sexes. The front of the card is reserved for history and the first examination; while on the back of the card the results of the more detailed subsequent examination can conveniently be recorded under appropriate headings.

Time of Examination.—According to the bill this will have to be at the time of admission to a public elementary school. If this is so, the phrase "time of admission" will have to be used in a somewhat elastic sense. It is impracticable to arrange for each child to be medically examined on the day of admission, but there would be no difficulty in doing this during the first term of school life.

Extent of First Examination.—For many reasons the routine examination on entrance should be limited to essentials. For this the facts recorded on the front of the card are quite sufficient. You will see that the left side of the card is reserved for the previous history of the child. Naturally, one would like this to be elicited at the actual time of medical inspection, so that further questions might be asked if needful. On the whole, however, the balance of convenience would seem to rest with the delegation of this part of the work to the teachers, or, perhaps, better still, to one of the health visitors attached to the public health staff. When, say, twenty history cards have accumulated in one school, arrangements would then be made to hold a medical inspection, and notice of this could be given to the parents. This, however, is a matter of detail to which I have not yet committed myself.

The right side of the front of the card gives the school or schools attended by the child, and the result of the medical examination. You will see that the matters dealt with are quite elementary, and do not entail removal of clothing.

Quantitative results are expressed by symbols. Thus, O = average, + = above the average, and — = below the average.

Should the family history, superficial examination or weight, suggest the necessity, a more detailed examination should be made and recorded on the card. If special supervision is required the card should receive a distinctive mark, and subsequent examinations be made half yearly.

Height and weight should be recorded in inches and quarters, and in pounds and quarter pounds. These figures will be found most useful as a

(Front.)

Name			School	from	to
Date of Birth			Physique	M.O.	Date
„ Measles			Clothing		
„ Wh. Cough			Obvious Rickets		
„ C. Pox			Vermin, Head	Body	
„ Diphtheria			Mouth Br.	Speech	
„ S. Fever			Conjunctiva	Squint	
			Dis. Ear		
			Height	Weight	
Does child snore					
Any phys. defects					
Phthisis in family					
			Notification to Parent, No.	Date	

Date				
Age				
Physique				
Obv. Adenoids				
Teeth				
Skin and Scalp				
Chest Insp.				
„ Percussion				
Breath Sounds				
Heart Apex Beat				
Ht. Sounds				
Hearing				
Speech				
Intellig.				
Near Vision R.				
„ „ L.				
Dis. Vision R.				
„ „ L.				
Refrn. No.				
Height				
Weight				
Notif. Parent				
M.O.				

means of checking one's impression as to the child's physique. They can also be tabulated from time to time for representative schools. Thus in 1905 we compared the height and weight of children attending secondary schools with those attending a good type of public elementary school and a slum school. The figures came out much as one would expect, the averages of the secondary school children exceeded the British Association Anthropometric Committee's averages at each period, while the slum school was decidedly below the average at each age period. The children attending the good type of elementary school were up to the British Association's standard in height, but below in weight.

At the time an attempt was made to correlate the height and weight of the elementary school children, with their place in school and social conditions. It was found that in standard VI. and VII. the boys and girls were superior in height and weight to other children of the same age. This suggests that the conditions which favour physical growth are also favourable to intellectual development.

Taking sufficiency of clothing as a test it was found that the undersized were on the average also underclothed, and there can be little doubt that both conditions are due to poverty or neglect.

Though useful as a check on general impressions, the routine compilation of averages is not worth the labour involved. The periodical weighing and measuring, and especially the weighing of children, is, however, of some value, as it directs attention to the less vigorous at the first examination, while failure to put on weight is in all probability of still greater significance. With a view of testing this we re-weighed at intervals of six months about 1,100 school children. Of these 117 had failed to gain weight at the end of six months, and 23 failed to gain weight at the end of twelve months. It was arranged to have these 140 children medically examined.

Inquiry was made at the school respecting their general health since the last measurement, and the following details were noted in each case:—The mental capacity as gauged by the teacher; physique; chest measurements; general condition of the teeth; throat; presence or absence of discharge from the ears; presence of external affections of the eyes; glandular enlargements; condition of the lungs and heart.

As the investigation was to a large extent tentative and experimental, the results obtained were not recorded in a manner that admits of easy tabulation, but the most striking facts elicited may be briefly referred to.

It was found that the 140 children examined exhibited the following departures from health —

	No. of Cases.		No. of Cases.
Organic heart disease	6*	Rhinitis	3
Functional heart trouble	2	Ear discharge	2
Adenoids	8	Emphysema...	1
Rickets	13	Scarlet fever	1
Lateral curvature ...	5	Tonsillitis	1
Bronchitis	6	Raynaud's disease ...	1

* Two of these were probably congenital.

It was also noticed that about 75 per cent. of these children suffered from badly decayed teeth, and it is not unlikely that this was largely responsible for their arrested development.

Visits were subsequently paid to the homes of the children, and the parents advised to secure treatment where necessary.

When calling at the homes inquiry was made into the method of feeding, presence of overcrowding, and the home conditions generally. Here, again, the results of the inquiries cannot readily be tabulated, but the following, among other causes, of malnutrition were obvious :—

Injudicious selection of food material.

Mother at work and children neglected at mid-day meal.

Inconstant work or illness of the father.

Overwork from running errands out of school hours.

To these we might add, from general experience, alcoholism, overcrowding in rooms, and insufficient ventilation.

Subsequent Examinations.—A more searching medical examination should be made when the child is admitted (usually at the age of seven) into a school for older children. For this purpose the back of the same card may be used. Space is also left for a 3rd, 4th, and 5th examination, should such be necessary. You will see that the teeth, heart, lungs, and special senses are examined at this stage.

This, then, is the general scope of medical inspection as I understand it. Though the amount of routine work is very considerable, this could be relieved by special investigations and inquiries that would give additional interest to the work by exploring fresh fields of usefulness.

So far we have dealt only with the methods of medical inspection. Now, it is obvious that we shall only be ploughing the sands if inspection simply leads to the recognition and tabulation of physical defects and deformities.

What practical purposes, then, will medical inspection serve? In the first place, the regular visits of the medical officer will stimulate the teacher to pay more attention to the health of the scholars. The indirect

gain that will thus accrue will be considerable, as anyone will recognize who compares a school in which the head teacher possesses a sanitary conscience with one in which that troublesome organ has not been developed.

In the next place the defects found must be notified to the parents. This will be work for trained women health workers, who must visit the homes, find out any social conditions (such as ignorance, alcoholism, overcrowding) on which the ill-health of the child may depend, and see that steps are taken to obviate these evils. In many instances steady pressure by a tactful but energetic worker is all that is required. In other instances a letter for a convalescent home may be needful, and the health visitor must therefore be in touch with local charitable agencies. In many cases something more is necessary. We will take three typical examples: a child suffering from defective vision, another from sore throat, and another from ringworm.

At present the parents of the child are urged "to take advice." As general practitioners rarely undertake eye work, this means procuring a letter for the nearest hospital with an ophthalmic department. In Croydon it also means the payment of a small fee at each visit to the hospital. Owing to the crowded state of hospitals much time is lost, as several visits have sometimes to be made before a complete examination can be secured. In the end the child is given a prescription for glasses, for which the parents cannot pay. Under these circumstances the medical inspector, health visitor, parent, and hospital doctor have all wasted valuable time, and the child remains *in statu quo.* If education authorities test sight they must ultimately prescribe glasses, and it would then be a simple matter for some voluntary agency to arrange for the supply at a reduced price of the cheap and simple lenses required by school children. A voluntary association is already doing this for the L.C.C. schools.

Moreover, the relief to the hospitals would be considerable. They are already suffering from over-pressure, and it is obviously unfair to expect the unpaid staff of our voluntary hospitals to undertake such an immense amount of extra work as the medical inspection of school children will ultimately entail.

In Croydon the present system of remitting eye cases to the hospital means that many children fail to attend and nothing is done.

Take, again, a child absent from school with sore throat. This may be mild diphtheria, and (from the point of view of preventive medicine) the milder it is the more dangerous to the community. In these cases the advice "to take advice" is frequently not followed, as the child

is not sufficiently ill to need physic. In Croydon we endeavour to look after cases of this kind directly, but if they increase we shall want a special staff for this purpose.

In the case of ringworm, and especially ringworm of the scalp, the attempt to deal with the disease on the "take advice" basis was a complete failure. Some parents did nothing at all; others sought the nearest chemist, who said the ringworm was "only scurf"; others paid perfunctory visits at long intervals to the medical practitioner whose fees were smallest, and possibly got value for their money. In only a minority of cases were the circumstances such as enabled parents to pay a private practitioner the necessary fees for the long continued treatment that ringworm requires. Nearly a year ago no less than 180 Croydon children were away from school on account of this disease alone. This meant a loss of valuable months of school life to a large number of children who, instead of attending school, were contracting habits of slackness and carelessness which the absence of discipline almost necessarily entails. It also, meant a loss to the borough of about £360 a year in exchequer grants, which are paid for average school attendance. The control of ringworm, therefore, was clearly a case of "philanthropy and five per cent." and the council accordingly decided to offer free treatment for ringworm, and so far have had every reason to be satisfied with the result. It might be argued that in so doing we were sapping parental responsibility, but the practical result is quite the contrary. Since we are in a position to offer free advice and treatment, we can take a strong line with parents who neglect their children, and who formally wriggled out of any pains and penalties on the plea of poverty.

Ultimately there is little doubt that more and more treatment will be undertaken at the expense of the State with advantage to voluntary hospitals, to medical men, and to the community. This indirect result of medical inspection I cannot now discuss, but in conclusion would impress the importance of the advance which preventive medicine made when it captured the schools, and would congratulate health-workers, and especially trained women workers, on the part which they will play as servants of a State, which

> ". . . . unwillingly sees
> One of its little ones lost,"

and has determined that they shall not be lost, but "have life, and have it 'more abundantly.'"

OBITUARY.

Surgeon-General Sir Joseph Fayrer, Bart., K.C.S.I., F.R.S., LL.D., M.D.,

Physician-Extraordinary to His Majesty the King.

(FELLOW.)

It was with the deepest regret that we announced, in last month's *Journal of The Royal Sanitary Institute*, the death of this distinguished officer of the Indian Medical Service, whose name has long been a household word among his countrymen. He passed away at his residence, Belfield, Falmouth, on May 21st, at the age of 82 years.

Sir Joseph Fayrer's career was indeed a remarkable one. Born at Plymouth on December 6th, 1824, few men have had a more eventful history to chronicle. He was the son of Captain Fayrer, who had served with distinction in the Royal Navy, by his marriage with Miss Agnes Wilkinson, who came of a Lancashire family. On leaving school at the age of 16, Fayrer began to study engineering, but evidently this was not an occupation congenial to him, for within a year he received an appointment as midshipman on a vessel belonging to the West Indian Mail Steam Packet Service. After three voyages he gave up the sea, and resumed his studies under a tutor at Southampton. At 19 he went to Bermuda, where his father had received an appointment connected with the convict settlement, and this event decided for him the profession to which he devoted all his energies during a long life.

Not long after his arrival in Bermuda a severe epidemic of yellow fever broke out. So, strongly impressed with the importance of the study of medicine, at the conclusion of the epidemic Fayrer resolved to prepare himself for the medical profession. With this object in view he returned to England, entered in 1844 as a student at Charing Cross Hospital Medical School, and in 1847 obtained the diploma of the Royal College of Surgeons. In the same year he was appointed Medical Officer of H.M.S. Victory for service at Haslar Hospital, but after a few months' service there he was invited by Lord Mount Edgecombe to accompany him, as his medical adviser, to the Continent, and received permission to resign his commission temporarily and to resume it on his return. During this

time he studied medicine and surgery at Palermo and Rome, and obtained the M.D. of the latter University. He also laid the foundation of that knowledge of the Italian language and literature which he loved so well to refer to in his declining years.

Returning to England he held for four months an appointment in the Ordnance Medical Department at Woolwich. He was then fortunate in obtaining another post as Assistant in the Bengal Army, and arrived in Calcutta in October, 1850, to take up his new duties. In March, 1852, he joined the Burmese Field Force as Field Assistant Surgeon. He had done such good service during this campaign that at the age of 28, and with only three years' service, he received from Lord Dalhousie as a reward for good work the important appointment of Residency Surgeon at Lucknow; the best medical appointment in his gift. He joined in September, 1855, and married in October, 1855, the daughter of Brigadier-General A. Spens, to whom he had become engaged shortly before. Two years later the mutiny broke out with all its attendant horrors.

The events which preceded the siege of Lucknow and the circumstances of the siege, and of the two armies which went to the relief of the city, are detailed in his autobiography. Surgeon and Mrs. Fayrer were among the besieged at Lucknow and endured their full share of all its anxieties, hardships, and privations. He was honourably mentioned in Sir John Inglis's dispatches from Lucknow, and on December 8th, 1857, received the thanks of the Government. He also obtained the brevet rank of Surgeon. He received war-batta and 12 months' prize money for the defence of Lucknow, was allowed to count a year's service towards retirement, and received the medal and clasp for the defence of the Residency.

After the mutiny Fayrer returned to England to recruit his health; after travelling about for a short time he went to Edinburgh, where he underwent a course of study at the Medical School. Having been appointed Professor of Surgery in the Calcutta Medical College, he obtained by special examination his degree of M.D., and returned to India in 1859. From that date until 1872 he occupied this appointment, and held a leading position in practice in Calcutta. In 1870, at the invitation of the Viceroy, he accompanied the Duke of Edinburgh on his travels through the north-west of India. He also served for a time as Lord Mayo's personal physician. In 1872, his health having given way, he returned to England, settled in London, and began to practise as a consulting physician. In 1873 he was appointed a member of the Medical Board at the India Office, and in December, 1874, he resigned the Service and succeeded Sir James Ranald Martin as President of that Board with the

rank of Surgeon-General. He retained this appointment until January, 1895, a period of twenty years, during which time he did a large amount of useful work.

In 1875–6 he accompanied the Prince of Wales (King Edward VII.), in the capacity of physician, throughout his tour in India. He was created a K.C.S.I. in February, 1876, having in 1868 been made C.S.I., and was elected F.R.S. April, 1877, an F.R.C.S.Eng. and LL.D.Edin. the same year, an LL.D. University of St. Andrews in 1889. He was also made a Ph.D. by the University of Padua, and a Fellow of the College of Physicians, Philadelphia. In 1871 he was appointed Honorary Physician to Her Majesty the Queen; in 1874 Physician in Ordinary to the Duke of Edinburgh, and on his return from the Indian tour, an Honorary Physician to the Prince of Wales. Shortly after his retirement from the India Office Board in January, 1876, he was created a Baronet, and on the accession of King Edward VII. to the throne was appointed Physician Extraordinary to His Majesty.

He was elected corresponding member of several learned societies in Rome, Paris, Lisbon, Milan, Brussels, and Philadelphia, and also received the decorations of the Gretian Order of the Saviour, the Egyptian Order of the Medjidie, and the Portuguese Order of the Conception. In 1897 he was made a Knight of Grace of the Order of St. John of Jerusalem.

Sir Joseph Fayrer was deeply interested in the work of The Royal Sanitary Institute. He was elected Vice-President of the Parkes Museum in 1883, and a Fellow of the Institute in 1888. He was President of the Birmingham Congress in 1898, and became a Vice-President of the Institute in 1901. When in London he attended the meetings of the Council as often as the busy life he led permitted his doing so, and took the greatest pleasure in assisting in the objects and advancement of the Institute.

Sir Joseph Fayrer was an ardent sportsman; he was devoted to yachting and fishing, and engaged in these pursuits up to the last. He was a man of great energy, strong purpose, and self-reliance. He had the very highest sense of truth and honour, and never hesitated to do or say what he considered right. He was gifted with sound common sense, and his conclusions were founded on reason. He was the best, the kindest of friends; sincere, sympathetic, and most unselfish, he was ever ready to assist by kindly counsel and advice. He had the loftiest ideals in life, and truly it may be said he lived up to them. He has indeed left to posterity the record of an honourable and useful life.

J.L.N.

JOSEPH GROVES, B.A., M.B.Lond., M.R.C.S., L.R.C.P.Lond., M.D.Bologna.

(FELLOW.)

Dr. Joseph Groves died on the 21st May, in his 68th year, at his residence, at Carisbrooke, Isle of Wight. He long enjoyed a high reputation as a physician, a keen sanitarian and a wise and capable administrator. For many years he successfully carried out the duties of Medical Officer of Health in the rural districts of the Isle of Wight. In serving authorities non-progressive, perhaps, in public health matters, his personal integrity and fearlessness helped him to overcome many difficulties in promoting measures beneficial to the inhabitants of the districts under his control.

He was born in 1839, being the eldest son of Mr. Joseph Groves, of Newport, I.W. At the age of 17 he entered commercial life in London, subsequently studying law, and finally medicine.

He was a great antiquarian, and one of the most reliable authorities on island antiquities. He resided in a cottage at Carisbrooke, which, together with neighbouring cottages belonging to him, were filled with old china, paintings, silver and antique furniture.

Dr. Groves represented the Southern Branch of the British Medical Association on the Central Committee. He ever had at heart the interests of those he represented when serving on the several committees of the Association.

He was a former President of the Incorporated Society of Medical Officers of Health. During his year of office he was untiring in his efforts to promote the good of the public health.

His whole life was governed by unselfish motives, a high ideal of conduct, and a great love of the poor, many of whom he attended medically without fee or reward. He hated toadyism and shams. His independent nature caused him to treat squire and peasant alike. One can best conclude by saying that he was lovely in character and lovable by nature, worshipped by the poor, and loved and respected by the many who were fortunate enough to have enjoyed his friendship.

Dr. Groves became a Member of the Institute in 1888, and a Fellow in 1904. A. W. H.

NOTES ON LEGISLATION AND LAW CASES.

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ADULTERATION.—*Sale of Food and Drugs Act, 1875 (38 & 39 Vict. c. 63), s. 25—Milk—Written Warranty—Future Deliveries—Evidence in Writing to connect Particular Consignment with Warranty.*

By a contract in writing, the appellant agreed to purchase from a company "the whole of the milk required for his dairy" for twelve months from October 1st, 1905, and the contract contained a warranty that all milk to be delivered by the company to the appellant should be pure. In June, 1906, milk was delivered to the appellant by the company under the contract accompanied by a delivery note, which showed that the milk came from the company, but which did not in terms refer to the contract. Some of the milk was sold by the appellant, and was found upon analysis to have had 28 per cent. of milk fat abstracted from it. On an information against the appellant for having sold the milk contrary to the provisions of the Sale of Food and Drugs Act, 1875, the appellant relied on the warranty contained in the contract as a defence under s. 25 of the Act :—

Held, that as the warranty was by the contract expressly applied to all milk sold by the company to the appellant during the specified period, the contract itself was sufficient evidence in writing to connect the particular consignment of milk with the warranty, and that the requirements of s. 25 had been satisfied.

WATTS v. STEVENS (1906). 2 K.B., 323 distinguished.

EVANS v. WEATHERITT. Div. Ct. 80, 2 K.B. (June, 1907).

LONDON.—*Carriage road not repairable by inhabitants at large—Repairs by local authority—Recovery of expenses—Jurisdiction of Metropolitan Police Magistrate—"Court of competent jurisdiction"—Metropolis Management Amendment Act, 1890 (53 & 54 Vict. c. 66), s. 3.*

A metropolitan police magistrate is a "court of competent jurisdiction" within the meaning of s. 3 of the Metropolis Management Act, 1890, and has jurisdiction to entertain proceedings for the recovery from the frontagers of the expenses of repairs done by a borough council under the provisions of that section to a carriage road which is not repairable by the inhabitants at large.

THE KING v. GARRETT, C.A. 881, 1 K.B., 1907.

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INFANT MORTALITY.

By Major R. J. BLACKHAM, D.P.H., R.A.M.C.

Member of the Honourable Society of the Middle Temple.

Read at Sessional Meeting, Plymouth, May 31st, 1907.

THE large preventable wastage which occurs during the first year of human life, not only in this realm but in many other countries, is perhaps the most important medical and social problem of the age, and is, at present, engrossing much of the attention not merely of medical officers of health and of physicians, but of statesmen and sociologists in nearly every quarter of the globe; and it may be interesting to show that the important division of State Medicine, known as Infant Hygiene, which claims so much of your attention as civilian sanitary experts, has, in view of the large number of women and children borne "on the strength" of the army, a world-wide importance for officers of the Royal Army Medical Corps, and, in consequence, much interest for military sanitarians. You are all perfectly familiar with the agencies at work in producing what Mr. Punch has styled "the modern slaughter of the innocents," so what I would ask you to do to-night is to discuss the preventive measures best calculated to remove, or at least to mitigate, this great national calamity.

"Infant mortality in the early weeks of life," says Dr. Newman, Medical Officer of Health for Finsbury, "is evidently due in a large measure to the physical conditions of the mother leading to prematurity and debility of the infant; and in the latter months of the first year infant mortality appears to be due to unsatisfactory feeding of the infant.

"From either point of view it becomes clear that the problem of infant mortality is not one of sanitation alone, or housing, or indeed of poverty, as such, but is *mainly a question of motherhood.*"

Improved sanitation, better housing, and more plentiful food should all, theoretically, have had good effects on this condition, but they have not; for, although there has been a marked fall in the death-rate for this country generally, and in some cities (Glasgow, for example) the death-rate has fallen one half during the past thirty to thirty-five years, the rate of infant mortality for the United Kingdom remains practically stationary.

With a diminishing birth-rate and vast colonial territories clamouring for settlers, this continued waste of possible empire builders is no mere parochial or professional question, yet it is curious how sanitary authorities, who will light-heartedly take over sewage and water schemes involving the expenditure of millions, with a few enlightened exceptions, seem to persistently avoid all schemes for the protection of mere individual life as unworthy of their consideration. They do not appear to have realised that modern State Medicine has advanced beyond the hygiene of mere environment to the hygiene of the person, and concerns itself just as much with the preservation of the health of the individual as with the drainage of the cities.

Even an enlightened Cabinet Minister, who is an acknowledged authority on education, has failed to realise that some portion of preventive medicine should be studied by every citizen, and has refused to make hygiene a compulsory subject in elementary schools.

With these few preliminary remarks I propose to suggest the measures by which we may attain to a higher standard of physical motherhood, healthier babies, and, thereby, a diminution of infant mortality.

I think such measures fall under three divisions, viz.:—

1. Measures directed towards the mother.
2. Measures directed towards the child.
3. Measures requiring special statutory powers.

Let us consider these *seriatim*. Measures affecting the mother fall, I think, under three headings.

1. First and foremost of these I would place the education of elder girls in the care of infants and young children.

The Right Hon. John Burns, in his address to the National Conference on Infantile Mortality last June, said, "What the mother is the children are. The stream is no better than its source"; and therefore he urged "First concentrate on the mother."

Mr. Burns' opinion, as an able President of the Local Government Board, and *ipso facto* the Minister of Public Health for this realm, is

worthy of all respect, but I beg leave to say he is wrong in his advice to *first* concentrate on the mother.

By the time a girl has become a mother she has sometimes "ideas" (and, as we know only too well, often very wrong "ideas") on baby rearing, and it is frequently too late to inculcate sound notions on infant hygiene when the responsibilities of maternity have actually arrived.

I would therefore paraphrase Mr. Burns' words to "First concentrate on the elder girls if you would diminish infant mortality."

Herbert Spencer has written so appositely that he might have been addressing Mr. Burns' audience, and I venture to quote his remarks as peculiarly apropos.

"If," he says, "by some strange chance not a vestige of us descended to the remote future save a pile of school books or some college examination papers, we may imagine how puzzled an antiquary of the period would be on finding in them no sign that the learners were ever likely to become parents."

"'This must have been the curriculum for the celibates,' we may fancy him concluding. 'I perceive here an elaborate preparation for many things, especially for reading the books of extinct nations and of co-existing nations (from which it seems clear that these people had very little worth reading in their own tongue), but I find no reference whatever to the bringing up of children."

"They could not have been so absurd as to omit all training in this gravest of responsibilities. Evidently then this was the school course of one of their monastic orders.'"

I am sure all will agree that it is indeed an astonishing fact that on the care and nutrition of those children whose whole future will depend on the ignorance or intelligence of their mothers, not one word of instruction is given to those who, by-and-by, will become parents.

Is it not monstrous that the fate of a new generation should be left to the chances of unreasoning custom or impulse, the advice of ignorant nurses, or the opinions of prejudiced counsellors, such as the mother of fourteen children who has lost most of them, and therefore "ought to know"?

Our first effort to obtain good motherhood is to secure that all elder girls should be taught the elements of infant hygiene as a separate portion of the school curriculum.

I propose that this instruction should be given in a regular systematic way under the supervision of medical men appointed by some central and unbiassed authority, not on account of their political views and party

influence, but on account of their special knowledge of this new and important branch of State Medicine.

Failing this, there is no reason why courses of instruction in feeding and tending of young children should not be given in all elementary schools by specially trained and certificated nurses. This has been done under the Manchester Education Authority for some years, and Dr. Niven, the Medical Officer of Health for the city, informs me that the courses have been productive of much good.

Nurses appointed to teach a subject of this nature should hold some special certificate, and it would be well if The Royal Sanitary Institute were to institute a certificate in infant hygiene as a qualification for appointments of this nature. In this matter we in the army might, I think, lead the way, and I have suggested elsewhere that all army schoolmistresses should undergo a practical, I had almost said a clinical, course of instruction in infant hygiene at one of our military families' hospitals, and that the hygiene of infant and school life should form an essential part of the entrance examination of army schoolmistresses, and a regular subject of instruction for elder girls in army schools.

2. The second measure affecting the mother is provision for the proper care of poor women during and immediately after the puerperium.

The Midwives Act of 1902 is an important measure in this relation, but we will not be able to realise its full benefit for some years, as many ignorant women have been registered under the Act, and until 1910 it merely protects the *title* of midwife, and does not protect from the "handy" but terrible septic, woman who does not *call* herself a midwife, but still practices midwifery for gain.

No organisation, charitable or otherwise, exists in the Three Towns for the purpose of caring for poor women during child-birth, and the result must be that very many valuable lives are lost for want of skilled advice during this critical period.

The military authorities are ahead of even the wealthy and ancient Borough of Plymouth in this particular, as they have established as far back as 1865 the only maternity institution in the West of England with the exception of the hospitals at Bristol. The benefit derived from this military maternity may be gathered from the attached Table No. 1, in which I have attempted to contrast the military infant mortality of Devonport with that of the civil population.

My table is, of course, only approximately correct, but I think it is sufficiently so to show that the prospects of passing through the perils of the first year of life is at least twice as good in the case of the soldier's

infant as in that of the child of the civilian residing in the same neighbourhood.

This advantage is, however, not merely a local one, but exists for the whole Army, as in all important stations similar provision for soldiers' wives exists, and everywhere the soldier's family is not merely well housed, clothed, and fed, but has prompt medical attendance provided almost at its doors. In further proof of the claim that the soldier is better off than the civilian in this respect I submit the attached Table No. 2 for the decennium, 1896–1905, showing the mortality rate for the children of soldiers in the United Kingdom and India as rendered in the Army Medical Department Reports. As Colonel Caldwell says in his work on "Military Hygiene," an objection "may be raised to the figures (in Table No. 2) on the ground that they include children at ages which are not to be comprised in the term infancy. This is no doubt in a measure perfectly true, but it must not be forgotten that men cannot marry 'on the strength' during the early part of their service; that practically all the children included in the table were born in the Army of parents shown on the 'married strength,' and that transfer to the reserve takes place early in life. If these facts are borne in mind it is plain that the number of infants in soldiers' families must be relatively high" (*Military Hygiene*, page 394).

I think you will agree that it is a matter of which the Army may well be proud that the death-rate of its children, even in India, where the climatic conditions are so inimical to the earlier years of life, is only about one-third of that of this ancient Borough.

In the attached chart I have tried to show by a graphic method the relative infant mortality-rate in London, Glasgow, Devonport, and the married families of His Majesty's army in this Garrison.

Granting, therefore, the advantages which the Army confers by skilled medical advice and attention during, and after, pregnancy, I commend to the consideration of the wealthy and charitable in the West Country the Society for Nursing Mothers, which was established by private enterprise in France in 1876, and has now the support of the French Government.

The Society is divided into two branches. One branch consists of homes where destitute mothers are received during the last month of pregnancy. They are fed and cared for until the time comes for them to be passed on to the maternity branch and then out into the world again.

The result of this beneficent institution has been that no woman from the homes has so far died in child-birth.

Such an organisation might, however, stagger West Country enterprise

by its extent and the large initial outlay involved; but our French neighbours have yet another preventive measure, which is quite within the reach of any body of private philanthropists.

The French have realised that a suckling mother requires abundant nourishment, and that it is often the lack of sufficient food which drives the poor mother to artificial feeding of her offspring in lieu of the nourishment which her own blood would supply were she in turn sufficiently nourished.

Once Nature's channels run dry, a suitably modified milk is unquestionably the greatest desideratum; but, prior to this, the feeding of the nursing mother should be the primary aim in preventing infant mortality.

Restaurants have been established in Paris where women nursing at the breast are fed gratis twice daily. There is no question asked as to birth, religion, or legitimacy. The woman is hungry and has an infant to feed. That is sufficient for the French philanthropist.

Surely this is an example which might be followed in our charitable England.

3. The third and last measure directed towards the mother is provision for the further supervision of female labour in factories, and the prevention of women from engaging in arduous labour during the three months immediately preceding and following parturition.

The present Factories Act, as you are aware, prohibits the employment of women for one month after their confinements, but this is not enough; and pending further legislation, employers of labour might be persuaded on humanitarian grounds to avoid the employment of mothers for the period suggested, and some might even be induced to establish crêches in connection with their factories as is done in France.

The factory crêche is, of course, an essentially different thing from an ordinary crêche. It is merely a nursery where children are cared for while their mothers attend to the loom or machine. When possible the infants are suckled by their parents, and artificial feeding is the exception rather than the rule.

The utility or otherwise of crêches generally is too big a question to undertake in the time at our disposal, but they are a measure in the prevention of infant mortality, which I consider of much importance. No institution of the kind exists in the Three Towns because, according to Dr. Williams, the able medical officer of health of Plymouth, we have no manufactories in which women are employed in any number.

I think that notwithstanding the absence of factories there is ample work for a crêche in Devonport and Stonehouse, as I know from my work

among the married families "off the strength" that there is a large number of women who go out to work as needlewomen and charwomen daily, leaving their children to the care of ignorant and dirty landladies who look after the unfortunate baby for a small fraction of its mother's earnings.

I sometimes see these daily nurslings at the Military Families' Out-patient Department, and their condition is too frequently truly pitiful.

The Alexandra nurses have represented to the Soldiers and Sailors Families' Association the desirability of establishing a crêche for the children of sailors and soldiers married without leave.

Personally I strongly advocate crêches for three reasons, viz.:—

1. Because the child has to be brought to the crêche clean, and therefore the mother is taught the necessity for cleanliness. Moreover, advice from the matron with regard to the use of "dummies" and bottles with tubes stands a fair chance of being regarded.

2. Because the child is properly fed and cared for during at least a portion of the day, and taught good habits.

3. Because the crêche being of necessity under medical supervision, illness is likely to be detected earlier, and "running ears" and like conditions, which are so frequently ignored by ignorant mothers, are treated and cured before they have time to work serious mischief.

These reasons are, I think, sufficient to justify the existence of such institutions, but if another were needed I would suggest their being used as schools for demonstrating to elder girls the principles of Infant Hygiene, which they have been taught in school, *in actual practice with real babies.*

We now proceed to consider those means of prevention specially directed towards the child, and we find that these again may be grouped under three heads, viz.:—

1. The provision of a pure milk for artificial feeding.

2. The appointment of lady health visitors.

3. Provision for the earlier registration of births.

1. The provision of a pure milk supply must take a very important place in all schemes for the prevention of infant mortality, as even deducting those unnatural parents who refuse to suckle their offspring, and those unable to do so as they have to earn their living, there are in all large communities a considerable number of women who are incapable of doing so.

Indeed, Dr. Holt writes: "Among the well-to-do classes in New York and its suburbs, of those who have earnestly and intelligently attempted to

nurse not more than 25 per cent., in my experience, have been able to continue satisfactorily for as long as three months. An intellectual city mother who is able to nurse her child successfully for the entire first year is almost a phenomenon. Among the poorer classes in our cities a marked decline in nursing abilities is also seen, although not yet to the same degree as in the higher social scale." ("Diseases of Infancy and Childhood," 3rd edition, p. 167.)

It would be interesting to know if your experience in the West Country is similar to this American experience.

Nothing, of course, is equal to *good* maternal nursing, but no method of feeding gives much worse results than *poor* maternal feeding.

Personally I think that among the higher classes artificial feeding, though an undoubted evil, is not a very serious one; but among the poor, or so-called working classes, where so many sanitary sins are committed in the name of bottle feeding, maternal nursing should be persisted in as long as there is any chance of success.

As, therefore, many mothers are unable to suckle their children, it is obviously necessary to secure pure cow's milk to supply the defaults of maternity, and to meet this desideratum every sanitary authority seriously interested in the question of infant mortality should establish a municipal milk depot. These depots, like most schemes for preventing waste of infant life, come from France, where they were started in 1892.

The French institutions encourage breast feeding, but where this is impracticable provide sterilized milk in a number of bottles containing the necessary meals for one day. The infants are weighed and examined periodically by a physician, and both mother and child receive any medical treatment required.

The first depot in this country was opened at St. Helens in 1899, and has been followed by several others in various parts of the country.

The only depot of which I have any personal knowledge is that at Finsbury, which may be taken as a type of what such depots should be.

The principles on which it is worked are: (*a*) absolute control of the milk from its source, and avoidance of the fallacy of sterilizing unclean milk; (*b*) medical supervision of every detail of the depot work, and of the infants using the milk; and (*c*) a discriminating distribution of the milk to those only which cannot be breast fed.

To meet the first principle the sanitary authority at Finsbury has arranged for a supply of milk from a farm in Essex, where all details of refrigeration, sterilization, and modification are carried out on the spot.

This appears to be the first essential in infants' milk depots, as it is

obviously important not to work on the lines of obtaining ordinary unclean milk and trusting to sterilization for removal of unsatisfactory properties.

"It cannot be too clearly understood," says Dr. Newman, "that sterilization does not make bad milk good, or dirty milk clean; nor is it sufficient to merely contract for a supply to the depot from some dairyman of good standing."

Complete control of the milk from the cow to the consumer is essential for a successful and scientifically correct infants' milk depot.

At Finsbury, infants requiring milk are introduced by medical practitioners, hospital nurses, sanitary inspectors, birth registrars, etc.

It is obligatory that the child should be brought once a fortnight to be weighed and, if necessary, examined by a medical man. No medical treatment is given, and if any is required the mother is directed to consult her regular medical adviser.

This is a very desirable, if not ideal, state of things, but failing this there are many ways in which milk contamination might be avoided.

Local sanitary authorities could easily raise the standard of cleanliness for milkshops, and surely the Plymouth City Fathers might prevent the exposure of an excellent bacteriological medium in counter pans, where the constant dipping with not overclean hands, flies and dust from shop and street, produce the culture of millions of pathogenic organisms, which is sold under the courtesy West Country title of "pure raw milk"!

2. We now pass to the second heading of this division, viz., the appointment of lady health visitors.

Plymouth has realised the importance of these officials in raising the general health standard amongst mothers, but Devonport and Stonehouse have still to learn their usefulness.

Not the least important of the duties of lady health visitors is to teach mothers how to *store* milk for infants.

"The poor have no pantries," and their milk is often stored in filthy vessels exposed to the most gross contamination.

Indeed, in the house of the comparatively wealthy the pantry in which, *inter alia*, milk is carelessly stored in uncovered vessels, is often a most insanitary apartment adjoining the servant's w.c.

3. We now pass to the third heading of this division and realize how appropriately it may be considered at this point, as it is a matter which lies midway between the question of lady health visitors and the third division of our subject, special statutory powers.

As you are aware, the law now requires births to be registered within six weeks of their occurrence.

For statistical purposes this arrangement works well enough, but for preventive purposes it is useless, as parents take full advantage of the legal time limit, and by the time the registrar notifies the medical officer of health and he, in his turn, requests the lady health visitor to visit the parent, the child has passed through the most critical period of its existence and, only too frequently, it is dead.

The law, therefore, requires modification, and the National Conference passed resolutions that all births and still births should be notified within forty-eight hours to the medical officer of health of the district in which they occur.

Pending, however, such powers being obtained by the tedious process of passing a Bill through Parliament, Alderman Broadbent, when Mayor of Huddersfield, has shown what can be done by private philanthropy.

The establishment of a private fund to secure the payment of a small fee for the early notification of births is a measure worth remembering in the prevention of infant mortality.

Registrars might be provided with a card of simple instructions in infant hygiene, which should be given to each mother on the registration of a birth. A card or some form of advice is now issued to military parents at many stations, and the Indian Government has prepared and distributed a pamphlet on the subject.

The final division of the subject now comes under consideration, and again I think we might group the new legislation required from Parliament into three Bills:—

1. A short Act on the lines of the Roussel law of France, prohibiting:
   (a) the use of undigested farinaceous foods for infants less than seven months old;
   (b) the sale of infants' foods which do not bear an analysis on each packet and a certificate from a Government analyst that they are non-injurious.
   (c) the use of feeding bottles with tubes and "dummies" or infant soothers.

2. An Act amending and consolidating the Infant Life Protection Act of 1897 and the Prevention of Cruelty to Children Act of 1904. This Act would:—
   (a) provide for the further protection of children sent out to nurse; every child adopted for lump sum or received for reward, whether alone or with others, would be inspected by a Government inspector till it attained the age of seven years;

(*b*) prohibit and penalize the leaving of young children alone in circumstances of danger;

(*c*) authorize the distribution by registrars of circulars giving advice on the care of children;

(*d*) control and vigorously restrict the life insurance of the infants.

3. An Act replacing the present Dairies, Cowsheds, and Milkshops Order of the Local Government Board. The National Conference considered that (*a*) the provision of regulations by the local sanitary authority should be compulsory, instead of optional, as at present, and that (*b*) the scope of such regulations should be extended to cover *dirty* milk, and should enable local authorities to prohibit the sale of any milk which fails to agree with the conditions of purity agreed upon.

This question of infant mortality seems to be one which draws the practitioners of Curative and Preventive Medicine closer together than any other subject with which I am acquainted.

The latter has become too much a matter of sewers and drains and costly (and perhaps useless) isolation hospitals, but in this matter of preventing the waste of infant life there is "marked recognition of the value of the special function of the physician, viz., the care of the individual unit." "The engineer and the architect work in communities, but upon the physician devolves the far harder task of working individuals" (McCreary). The engineer and architect have rendered yeoman service to the cause of sanitation, but they are our servants and not our masters, for the protection of the public health is pre-eminently the work of practitioners of medicine, and there is no more promising field in our art than the prevention of disease in childhood. "The majority of the ailments from which children die, it is in the power of man to prevent." (Holt's "Diseases of Infancy and Childhood," p. 46.)

The supervision of child rearing by skilled physicians, not for the purpose of curing but of preventing disease, is the latest development of State Medicine, and in this work, I think, will be found plenty of scope for the devoted labour which is now largely wasted on the removal of pathological conditions, which, under a more advanced and enlightened system of Preventive Medicine, would never have come into existence.

[*For Tables see over.*

TABLE I.

Showing Approximate Infantile Mortality amongst Married Families of His Majesty's Troops at Devonport during the Decennium 1897—1906, and the Civil Infant Mortality during the same period.

Year.	Births recorded at Military Families' Hospital.	Deaths under One Year recorded at Military Families' Hospital. In & Out Patients.	Approximate Military Infant Mortality rate per 1,000 Births.	Recorded Infantile Mortality per 1,000 Births, Civil Population of Devonport.
1897	45	1	22·2	149·2
1898	34	0	Nil	140·7
1899	52	6	118·03	163·2
1900	38	6	157·9	165·6
1901	44	0	Nil	146·2
1902	41	0	Nil	122·4
1903	70	2	28·5	73·0
1904	80	3	37·5	115·2
1905	90	2	22·2	135·9
1906	112	5	44·6	111·4
			Average for decennium = 43·09	Average for 10 yrs. = 134·6

TABLE II.

Showing the Mortality per Thousand of Children at all ages in the Army, at Home and in India, for the Decennium 1896—1905.

(Statistics for 1906 are not yet available.)

Year.	Great Britain and Ireland.	India.
1896	16·57	45·60
1897	20·36	50·49
1898	18·25	41·13
1899	18·31	41·03
1900	20·82	46·88
1901	16·62	32·95
1902	14·39	45·23
1903	12·97	36·99
1904	15·58	38·80
1905	12·06	36·87

TABLE III.

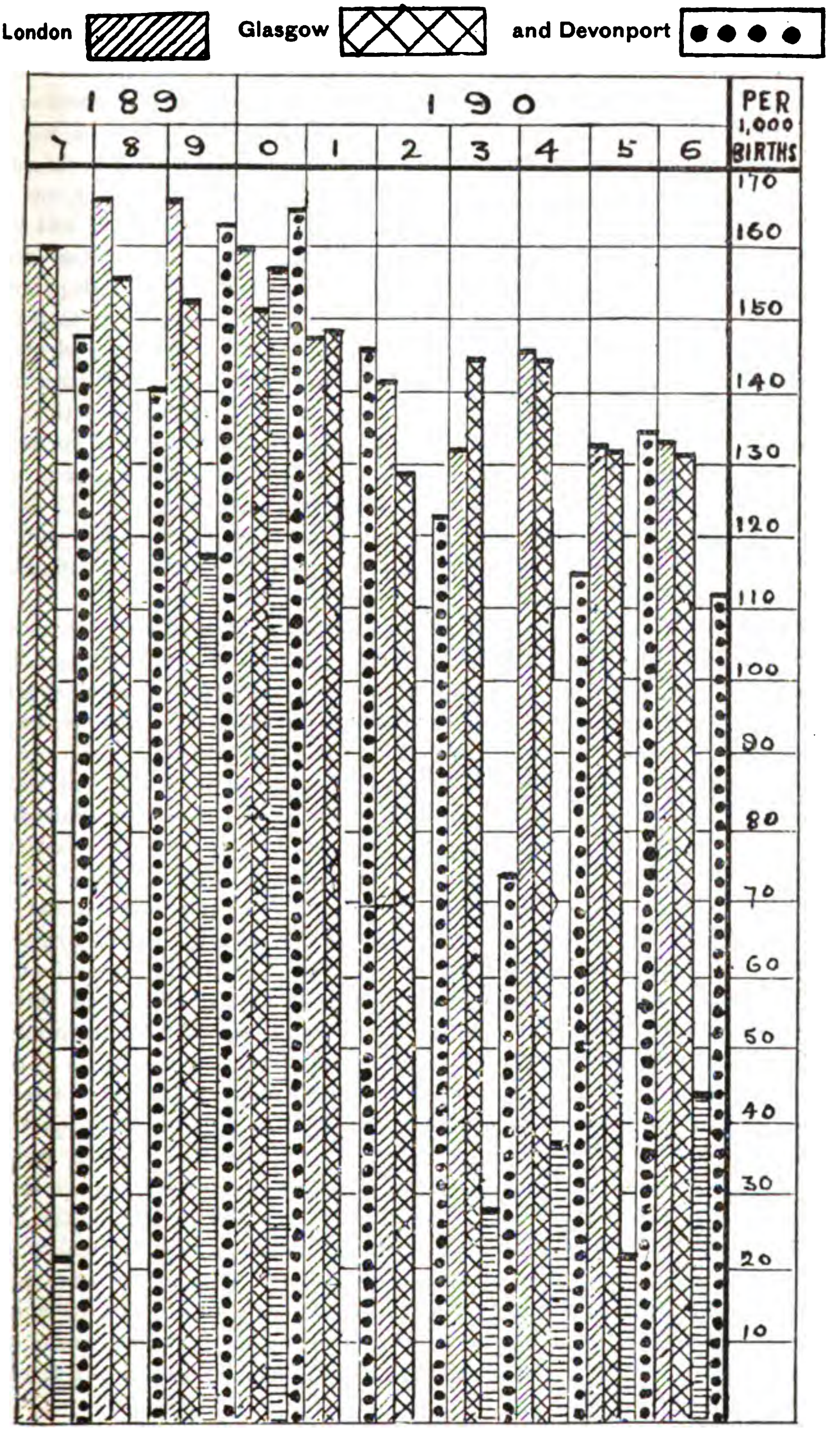
Showing strength of Women and Children at Five of the principal Stations of the Army in 1905.

	United Kingdom.	India.	South Africa.	Malta.	Egypt.
Women	18,933	3,375	1,116	548	180
Children	25,612	5,154	1,923	860	285

From the Army Medical Department Reports.

Chart showing the Infant Mortality

in London Glasgow and Devonport



and the approximate Military Infant Mortality in Devonport for the decennium 1897-1906.

Mr. Paul Swain, F.R.C.S. (Chairman of Plymouth Sanitary Committee) said that he had always held that in dealing with the housing question, and especially with regard to this question of infant mortality, one of the very best things they could do was to appoint women inspectors. He was glad to see that the Plymouth Corporation had been in advance in this matter, and that Exeter had followed in Plymouth's wake. But, as the lecturer had told them, Devonport still lagged behind. He thought the whole matter was entirely an educational one, and the well-trained lady inspector was the best person to educate the mother as to the bringing up of the child, and also as to the best sanitary methods to adopt. It was an extraordinary fact that the clergy and ministers of all denominations utterly failed in their conception of their duties from a sanitary point of view in visiting the poor. He admitted their zeal, and also the zeal of the lady district visitors, but, at the same time, he also recognised their ignorance of the real work they had to do and the way in which they ought to do it. He suggested that the clergy and ministers of all denominations should link themselves up with the women inspectors, and so gain from them that knowledge which they were quite ready to give in sanitary affairs.

Dr. S. Noy Scott (Plymstock) said he thought Major Blackham very properly laid great stress on the great fact that the chief cause of infant mortality is the neglect of breast feeding. He never lost an opportunity of impressing upon a mother the grave neglect of duty she was guilty of when she deliberately abandoned the means which nature had given her for providing her baby with food--not only was she guilty of a great wrong towards herself, but she was also doing irreparable mischief to her offspring. One reason why some women of the poorer classes were sometimes unable to efficiently nurse their babies was that their husbands do not provide them with sufficient food. It does not seem to be widely recognised that the nursing mother requires more, and more frequent, food than at other times. It is equally true that if we want to rear healthy strong babies we must do all we can to promote the health and strength of the parents—not only healthy mothers but healthy fathers. The part that the father ought to play in the rearing of healthy babies was too often lost sight of, and, personally, he thought much blame attached to the father in regard to infant mortality. In spite of all that had been done in the cause of temperance, many of the working men of England still spent an utterly unjustifiable amount of their earnings on alcoholic liquor, and whilst this was so it would be difficult for the wives of such men to obtain, during their periods of pregnancy and nursing, such extra food as they ought to have. The question of the falling birth-rate could only be referred to as indirectly bearing on infant mortality, for if such falling birth-rate had come to stay (and, unfortunately, all evidence pointed that way) it only increases the relative importance of lessening, by every means in our power, the rate of mortality amongst such babies as are allowed to be born, for (leaving for the moment all the higher ethical aspects of the case)

it should be preached continually that it pays much better to breed healthy children; and if a child, during its first and second years of life, be provided with proper food, proper clothing, and fresh air, and is kept clean and wholesome, such a child has an infinitely improved chance of reaching healthy adult life, and so of becoming an useful member of the State. It has been proved again and again, that in proportion as an infant is nourished on its natural food during the first nine months of its life, so is its chance of becoming a healthy child increased, chiefly because of its greater power of resistance to disease. His experience made him much more confident in the treatment of an infant who may be ill if he were informed that it was breast-fed. Again, that period of a child's life, known as the teething time, is passed much more comfortably, and is freer from gastric disturbance and convulsions if it be breast-fed. We therefore, on behalf of that most helpless, but none the less important, section of our community, the child population, insist on measures being taken for their protection. Such measures may roughly be divided into three classes: (1) that which the medical profession can do; (2) that which other individuals of the public can do; (3) that which the State can do. Up to the present doctors are agreed that the chief cause of infant mortality is "unnatural feeding." The first remedy they suggest is maternal nursing wherever possible. The next remedy is the use of good and pure cows' milk used in its proper way, and they teach constantly that when a mother cannot provide all the milk that her baby requires, it should be supplemented by good cows' milk. On the other hand, doctors find that a most unreasonable prejudice exists against cows' milk, more especially when it has to be used as an addition to breast feeding. As to what other individual members of the public could do, he agreed with Major Blackham that the educators of our girls could do much, for surely those who are to be the mothers of the future should know something of the rational methods of rearing and treating infants, and although it may be argued that it is hardly possible to teach girls at school the practical management of a baby, yet indirectly much might be done by teaching them the enormous importance of personal and domestic hygiene, the influence which general cleanliness, fresh air and sunlight have, and the equally valuable effects of good, simple, and nutritious foods, together with the economical preparation of useful dishes from inexpensive materials. As far as possible boys also should be included in this curriculum, and lessons on such subjects would prove much more valuable to all the children in our elementary schools than much of what is supposed to be taught there at present. He fully agreed with Major Blackham in the necessity of an authorised statement of the composition of all artificial foods being attached to each package. Then again, he was in accord with what Mr. Swain had said about the parsons, for he did not think our public teachers of morality would be using their pulpits for any less high purpose than they are intended to be if they would occasionally use them to insist more on the duties of parenthood, and, in fact, if they preached a little more about "one's duty towards one's

neighbour." He welcomed legislation which would increase our control over unhealthy dwellings; over milk supplies; over pregnant and nursing women (by preventing them engaging in unsuitable work); over unthrifty, careless, negligent, or drunken fathers (by enforced work, if necessary, in labour colonies); and over misleading and lying advertisements, especially those referring to abortifacients and improper infant foods. In a small pamphlet prepared by consent of the Rural District Council, he gave simple instructions for the management of infants, and each person registering the birth of a child is given a copy. It is a curious fact that coincidently with the distribution of these instructions and the introduction of stricter control over the local milk supply (by the enforcement of by-laws under the Dairies and Cowsheds Orders), there had been a remarkable fall in the amount of infant mortality. The average of the five years before the distribution (1896–1900) of the pamphlet was 134·6 per 1,000, whereas that for the five years since (1901–1905) was 98·01, and during last year, viz., 1906, it was only 78·88.

Dr. C. A. Hingston (Plymouth) said that behind all the actual causes of infantile mortality lie two great factors, ignorance and prejudice, and our attention should be mainly directed to combat and overcome them. To accomplish this, some of the earliest lessons in all elementary schools should consist of the simplest sanitary instruction, and could be applied to home and nursery life in the classes of the elder girls. Such lessons would gradually and certainly undermine many of the most dangerous traditions which cause so much infantile deaths. The appointment of lady sanitary inspectors is of the first importance, and their duties in enforcing sanitary laws and regulations would be much lightened if the necessity for such laws had been learned by school instruction. In connection with these visits of the lady inspector, early notification of births would ensure her visit at a time when she is most needed, as the first week of infantile life frequently determines the question of life and death, and mistakes made then are frequently fatal in their results. Crêches in London and the large manufacturing centres are most useful and supply a marked need, but in this town and neighbourhood where comparatively few women are employed in manufactures, the need is not so great, and a crêche established here some years ago proved a failure from the limited number of mothers who sought their babies' admission.

Lieut.-Col. R. Caldwell (Plymouth) thought that Major Blackham had not insisted strongly enough on the influence of the dwelling in regard to infant mortality in the army as contrasted with infant mortality in civil life. If any unprejudiced person would compare the average quarter occupied by the private soldier's family with the average dwelling occupied by the corresponding class among civilians, he would see at once that the advantages were enormously in favour of the former. Man is the creature of circumstances, and of all the

circumstances acting on him the dwelling must certainly be one of the most important. Squalid and degrading surroundings produced squalid and degraded beings, and squalid and degraded beings naturally spent their time in the public-house and take no particular interest in their children, and still less in the exhortations of the health visitor; in short, a train was produced of those evils which the medical profession were endeavouring to combat in detail instead of collectively. The same principle applied here as elsewhere, viz., the necessity for seeking ultimate causes and dealing with them fearlessly, no matter what they may be; one of the ultimate causes in the present case is the dwelling. The speaker had personal experience of the dwellings of the working class in a large manufacturing town in the north, and the conditions of life were, owing to no fault of the people themselves, frightfully detrimental to the interests of the children. The only chance that many of these people had of learning anything of decency, or comfort, or cleanliness was when they were in jail. It was difficult to see how these dwellings could be improved owing to the enormous sums swallowed up by ground rents, conditions which the people had themselves created by their own industry; the ratepayer was sufficiently burdened, while the ground landlord fulfilled the pleasant functions of a recipient only. A sweeping measure of housing reform would not put an end to excessive infant mortality, but it would deal a direct blow at one of the principal roots of the evil.

DR. WEBBER (Plymouth) found that fifty per cent. of the mothers that came under his notice were physically incapable of nursing their children. He always urged a trial of maternal feeding, but found that in many cases six weeks was the limit to which the mother's strength would last, and nursing often had to be abandoned in less time than this.

DR. SOLTAU (Plymouth) said that the general trend of the discussion seemed to indicate that the root of the whole evil was ignorance, and that that must be combated first. He considered that it was the duty of all interested in the question to insist on the importance of education. He referred to the experience afforded in Plymouth, and considered that sanitation, model houses, and a pure milk supply, although in themselves excellent and important factors, were of no great value unless there was at the same time an educative process to teach people the utility and importance of these measures. He referred to what he considered the important point of the carrying of infection by flies, and the influence which this probably had on the spread of disease, especially by means of milk infection. He urged the importance of the Three Towns uniting to grapple with a great evil.

DR. ROSA BALE (Plymouth) agreed with Dr. Webber, but urged that the child would do very well on good cow's milk. Mothers were all too anxious to try patent foods, and she was afraid the medical profession was not entirely blameless in this matter. They often recommended patent foods. She believed

the intemperance of women to be one cause of infant mortality, and pointed out that the series of articles lately published in the *Tribune* by Mr. Sims had revealed a very serious aspect of this question, with which it was to be hoped that future legislation would deal.

Dr. Wm. Hammond (Liskeard) said that while squalid houses and insanitary surroundings were a large factor in the excessive infant mortality, yet he believed that ignorance and prejudice (as a former speaker had said) were at the bottom of most of the avoidable deaths. He welcomed more women inspectors for the purpose of teaching the mothers, and helping them to do what was right; and the press might do much if it would refuse to publish the advertisements, often grossly misleading, of various patent foods which could not take the place in health of breast feeding, or, failing that, of milk properly diluted. Such foods were largely the cause of a low vitality, and the result was many deaths. Some people might say: How could the papers be expected to discriminate when some medical men ordered these foods? Of course, they must know that the almost universal verdict of the medical profession is *against* these products of the chemist if the child is healthy, that in some illnesses they are and must be used, and that the only difficulty is the refusal of a paying advertisement.

Dr. Sydney G. Vinter (Torpoint) said that from the remarks of previous speakers it was obvious that an unnecessarily high infant mortality had a double bearing. There was, first, the unnecessary pain caused to the individual infant; there was, secondly, the loss to the nation of the infant's life, with all its potentialities for usefulness. Under this second heading he should like to emphasise the remarks of Dr. Noy Scott on the influence of improper advertisements, where the advertisers seek to enable women to destroy possible infant life. In 1903 he pointed out to the National Vigilance Society the urgent need of obtaining an amendment of the Indecent Advertisements Act of 1889, which was promoted by them. The matter had now been taken in hand by the London Council for the Promotion of Public Morality, acting with the British Medical Association, and a private Bill was being promoted. The object of this Bill was to strengthen the law against the publication of improper advertisements. The London Council for the Promotion of Public Morality was anxious to receive all the moral support which it could obtain, and there was no society whose support they would more value than that of The Royal Sanitary Institute.

Dr. Hobe Brenton (Plymouth) said he agreed with the previous speakers, who attributed the undue infantile mortality to ignorance and prejudice. He personally considered, from a long experience among the poor, that a very great portion of the infantile mortality was due to the prevailing practice of feeding young infants with food consisting more or less entirely of carbo-hydrates. He found it very difficult indeed to convince mothers of the danger of so doing,

but a great deal could be done by instructing prospective mothers, by lectures or other method of instruction, in the manner of feeding infants, and that infants were physiologically unable to digest starchy food. He approved of the appointment of a second lady sanitary inspector, who could visit the homes of children and improve the hygiene, as in many houses in poor-law practice it was not a wonder why infants died, but why they lived.

MISS M. MARK (Plymouth) said that in her opinion the chief factors in the production of the abnormal infantile mortality of this country were ignorance, carelessness, improper feeding, and the absence of any intelligent system of education of children in the elementary schools. She referred especially to the imparting instruction in domestic hygiene, elementary physiology, and the value of foods.

MR. J. J. JUDGE (*Western Evening Herald*) said it was hardly fair to expect the press to be able to discriminate between the various proprietary foods. From what one speaker had said, it seemed that doctors themselves were somewhat to blame in the matter of these foods. If they recommended them, they believed in them. Where doctors differed, then, how was the press to decide? Some time ago, if he recollected aright, a certain brand of condensed milk was condemned; a day or two after, a woman wrote to say that she had known children to be brought up healthily on that very milk.

DR. F. M. WILLIAMS (Plymouth) said that, in his opinion, the two great factors tending to bring about the abnormal infant mortality of the country were (1) physical deterioration of the inhabitants of urban centres, so that from the stock breeder's view they were breeding from a stock which was physically and mentally unfit to produce offspring that were either physically or mentally fit; (2) there was an enormous number of children born of a parent or parents who passed on to them the effects of communicable preventable disease, which, at present, was in no way controlled by legislation. He referred, of course, to syphilis.

DR. H. B. PALMER (Plymouth) first wished to point out that if the reduction of infantile mortality was to be seriously undertaken, consideration would have to be given to parental conditions. He pointed out that in an average practice, he found from the counterfoils of the death certificate book that fully forty per cent. of the certificates given for children under two years of age were given for children under ten days; in other words, for children who had never practically commenced to live. Of these children a large percentage had syphilitic parents, and in this district it might be advisable to consider if the reintroduction of the Contagious Diseases Acts might not be beneficial. He objected to the deprecatory remarks that had been made about patent foods in general, and stated that he had seen thoroughly healthy children reared on the majority of them, and

stated that they had their uses. From his experience, he thought that poverty was the principal cause of the large infantile mortality. Poor people succeeded better in rearing their first child or children than the later ones, and from this he inferred that ignorance was not so important a factor as was maintained. The question of a municipal supply of sterilised milk was on the horizon, but he did not think much of the project; and that if this was to be used as an agent to check the infantile death-rate, it would be better to supply sterilised milk free of charge to parents with three or more children than supply the whole town with the milk under the cost of production, as it would be necessary to do if the object were to get the majority of mothers to use it. It was absurd to think that sterilised milk would act as a panacea against an infantile death-rate due to multiple causes.

Councillor S. J. Page (Plymouth) thought that the crux of the problem of infant mortality was in the homes of the poor, and the condition under which they lived. When four or more persons lived in one room in slums, where little or no sunlight penetrated, and in which all the domestic arrangements had to be carried on, it was impossible to rear healthy families. It was useless to talk of educating women and children compelled to live under conditions where it was impossible to apply any of the principles taught. Sterilised milk was of very little use in homes where the milk was contaminated again within half an hour after it had been brought into the home. He was convinced that until the slum dwellers lived in healthier houses, very little improvement would result. In Plymouth they were faced with the awful knowledge that about five hundred infants die every year before they reach the age of twelve months, and this alone should be sufficient to urge The Royal Sanitary Institute to use every means to arouse the public conscience, and compel local bodies to remedy such a state of things. When the homes were improved, education and sterilised milk would become powerful aids to perfect the cure.

Councillor A. E. Wood (Plymouth), as a layman, felt some diffidence in entering the discussion after so much expert evidence had been given; but he dissented from the comparisons made by the lecturer, considering that they were not fair. It must be remembered that the Government provided for the soldiers and their families sufficient accommodation and air space, and even prisoners were ensured a sufficiency of air space; but not so the ordinary person. The Local Government Board had no fixed rule with regard to air space, but it was left to the caprice of medical officers of health to decide that point. While agreeing that the subject was of vast importance, and believing that everything possible should be done to diminish the great infant mortality, yet there were prominent townsmen present who, while regretting the facts as presented, did nothing to ensure the worker a wage which would enable him to live a better and healthier life, and probably there were others from other places who were equally neglectful. Dr. Bale had given the conference some harrowing

pictures of what occurred in London, where women with young children frequented public-houses; but he ventured to suggest that it was possible that these public-houses were more sanitary than the homes of these very people. Possibly some men spent in beverages money which would be of great service to the women, both before and after confinement; but could this be wondered at when many families lived in one-room tenements, and could surprise be felt if, when a man, after a day's hard work, arrived home to find that one room filled with clothes to dry after washing day, he went to seek some more wholesome atmosphere? If this regrettable waste of infant life was to be stayed, more attention would have to be given to a wholesome housing reform, and an increase of the income of the poorer of our town dwellers.

MAJOR BLACKHAM, in reply, said he believed that Col. Caldwell's opinion with reference to environment had much evidence in its favour, and instanced the improvement in physique and appearance which the healthy environment of a barrack so rapidly produced in the recruit. He could not agree with Dr. Hammond that the press was to blame for publishing advertisements for pernicious infants' foods, as the other speakers had shown that doctors were not guiltless of recommending some preparations of this nature. What was wanted was a modification of the Roussel law of France, and an earnest, intelligent appreciation of the importance of each infant to the State, which the great French republic had grasped, but we had not yet realised in this country. It was useless to deplore a falling birth-rate while the slaughter of the innocents went on. The nation could compensate for fewer births by fewer infant deaths, if it only seriously tried to prevent the waste of child life. This was, indeed, no professional or parochial question, for each male infant death was a loss to the Army of a potential recruit, and to civil life of a possible defender of the Empire.

DR. WARD also spoke in the discussion.

CONFERENCE AT DUBLIN.

INAUGURAL ADDRESS,

By SIR CHARLES A. CAMERON, C.B., M.D., F.R.C.P.I., F.R.C.S.I., D.P.H.,

Professor of Hygiene and Chemistry, R.C.S.I.,

(FELLOW.)

Delivered Tuesday, June 25th, 1907.

I DEEPLY regret that this Conference on subjects relating to public health and private hygiene is not opened, as it was hoped it would be, by an address from the Earl of Rosse. My regret, and I am sure yours also, is accentuated by illness being the cause of the noble Earl's absence. Occupying, as he does, a high place among men of science, I am sure that his address, if he were in my place, would be in every respect worthy of his high scientific reputation. At short notice I have been called upon to take his place; and if I fail in interesting you in the subjects and treatment of my address, it is because I have been unable to devote sufficient time to its preparation.

The Royal Sanitary Institute.

Of The Sanitary Institute and its good work I have some personal experience. It was instituted in 1876, and its first Congress and Sanitary Exhibition were held in the following year at Leamington. A very distinguished sanitarian, Sir Benjamin Richardson, presided on the occasion. He had written much to promote the cause of sanitation, and was the author of the well-known book, "The City of Hygeia." I took a part in that Congress, which was not a large one, nor was the sanitary exhibition in connection with it of much extent. They were, however, the beginning of Congresses and Exhibitions which have grown larger and

more important year by year. Associated with them have been many of our greatest sanitarians, such men, for example, as the veteran hygienist Chadwick, Captain Sir Douglas Galton, Prof. de Chaumont, Dr. Parkes, Sir Joseph Fayrer, G. W. Hastings, M.P., Prof. Corfield, *et hoc genus omne*.

In 1884 The Sanitary Institute held its seventh Congress in Dublin, under the presidency of Sir Robert Rawlinson. He it was who gained much celebrity by smashing, for ventilating purposes, the windows of the hospitals in the Crimea during the war in that country. He did as much for sanitation in our army in the Crimea as Miss Florence Nightingale accomplished in the nursing of the wounded and sick soldiers.

I was President of one of the Sections of that Congress, and had the pleasure of hearing a paper read on "Irish Sanitary Administration," by Surgeon-Colonel Flinn, who is one of the two Honorary Secretaries of this Conference. Now that he is a Medical Inspector of the Local Government Board and engaged in the administration of the sanitary laws, I am sure that he is earnestly trying to remedy those defects in their administration which he so vigorously attacked when not in office himself. He has recently made a very elaborate and valuable report on the state of Public Health in Dublin.

In 1892 I had the pleasure of presiding at the Institute's Congress at Portsmouth. On that occasion the London *Times* did me the honour of making my address the subject of a leading article, and it published my address *in extenso*. Since then I have attended several Congresses held by The Royal Sanitary Institute. I mention all this to show that I know a good deal about the Institute, and am in a position to testify to the influence which it exercises in the promotion of sanitary reforms. It has been largely instrumental in the adoption of general and local legislative measures for improving the condition of the public health. Its museum in London, and its annual sanitary exhibition in provincial towns in England, Ireland, and Scotland, have led to the adoption of better systems of ventilation and drainage, of economy in the combustion of fuel, and in lessening the nuisance arising from the issue of black smoke from factories. It has, above all, helped to educate public opinion as to the necessity for sanitary measures, and to show that their results justified the expenditure of the money required to carry them out.

Two important departments of the Institute are the holding of examinations of persons desirous to qualify for the offices of town surveyor, sanitary inspector, and inspector of meat; and the delivery of courses of lectures on sanitary science in various centres of the population.

Sanitation has Reduced the Death-rate.

In the very early part of the last century there were no medical officers of health, there were practically no sanitary inspectors. The laws relating to public hygiene might almost be expressed by the word *nil.* The water supplies to towns were almost wholly obtained from local wells, which were rarely quite pure. The main drainage of towns was almost unknown. The water-carriage system of filth removal had not commenced. Disinfection was rarely practised, and never in a really efficient manner. Can we wonder, then, that the urban mortality was very high and greatly in excess of the death-rate in rural districts!

During that long and dreary period, aptly termed the dark ages, the population of these countries, and of most of Europe, scarcely increased. This slow increase of population was mainly due to the insanitary conditions under which the people lived. Our information as to the numbers of the population of Europe in the middle ages is not accurate, but it was certainly small as compared with the immense population of the present time. I am inclined to think that after the collapse of the Roman Empire, and its invasion by the barbarian hordes from the north and east, population rather declined than increased. It seems certain, however, that any increase must have been small during the long ages between the fall of the great Empire and the 18th century. Wars, plagues, insanitary conditions were the causes which prevented the natural increase of the population. According to Dr. Malthus, population unrestrained should double itself in 25 years; but even assuming that it would require a century to double its numbers, at that rate, and taking account of emigration to other parts of the world, the present population of Europe should be much greater than what it is. As an illustration of the slow increase of population until comparatively recent times, I may mention that in the reign of Queen Elizabeth the population of England and Wales was estimated at five millions. A century later the estimated population was only one-and-a-half millions greater. The estimated population in 1665 was 6,450,000; 136 years (1801) later the population amounted to 8,892,536. One author has shown that probably the population of England did not increase 30 per cent. in 700 years.

Broadly speaking the great increase of population in England and Wales commenced early in the 19th century. What a contrast, is there not, in the census figures for 1801 and those for 1901! Population in the former year, 8,892,536; in the latter, 32,527,843. In a century the population increased 23,435,307, and was nearly quadrupled. Since 1901 this great increase is maintained, the estimated population in the middle

of 1907 being 34,945,600. On the other hand, the population of Ireland is now 1½ millions less than it was in 1801. This great reduction of population is due to emigration and to other causes which I cannot discuss in this address.

Although in the 19th century there was this remarkable increase of population, yet emigration greatly increased, and was not to the same extent compensated for by immigration.

From the Bills of Mortality in the City of London, which certainly did not exaggerate the number of deaths, it appears that the death-rate in the City during the period 1728 to 1780 was in the ratio of about 50 persons per 1,000 of the population. In 1906 the death-rate was 15·11 per 1,000, or corrected for age and sex distribution, 15·88.

Sir William Petty has shewn that the deaths in Dublin in the 17th century exceeded the births by three fourths.

In Manchester the mean death-rate during the decennial period, 1861–70, was 35·38 for males and 36·36 for females. In 1906 the corrected death-rate was 21·37.

The mean annual death-rate in Liverpool in the decade ending in 1875 was 31·3 per 1000. In 1906 the crude rate was 20·64, and the corrected rate 22·15.

The great differences between the urban and rural death-rates, which formerly were so striking, have been greatly lessened. This is all the more remarkable as density of population has usually been regarded as a factor in producing a high death-rate. Many years ago Sir William Gairdner of Glasgow pointed out that whilst the death-rate in England as a whole was 15 per 1,000 persons living, it rose as the density of population increased until it became 27 and upwards when the density was 2,900 per square mile. This fact shows that at the time the observation was made (which was when Glasgow's death-rate was 30 per 1,000) there were insanitary conditions causing disease and decreasing the normal duration of human life. Long ago, the mean expectation of life in those who lived all their life in the country was probably twice that of the dwellers in the towns; but coming to the period of correct registration of vital statistics we find that even in recent years the difference was very great.

In the decade ended in 1860, the urban death-rate was 24·7 per 1,000 and the rural rate 19·9, a difference of 4·8. In 1906, the urban corrected rate was 16·88 and the rural rate 14·42, a difference of 2·46. There was in 1906 only one death per 1,000 of the population of London higher than in the country districts.

Decrease in the Birth-rate.

The percentage increase of the population during each decade of the 19th century does not quite correspond with the decrease of the death-rate as one might expect. In the first half of the 19th century the mean decennial increase of population, was in the ratio of 14·76 per cent., whilst in the last half it was only 12·65 per cent. An increase in the number of emigrants in the second half of the century accounts partly for the difference; but it must also be to some extent due to declining marriage and birth-rates, especially the latter. In the period 1871–1880 the rate in England and Wales was 35·4 per 1,000 of the population; in the next ten years it fell to 29·9, a fall of 5·5. In 1906 the rate was 27, or 8·4 below that of the period 1871–1880, and is the lowest on record.

In Ireland the birth-rate is less than in England, due partly to the population being more a rural one. About forty years ago it was about 25 or 26, but registration of births at that time was not so accurate as it has been since the Registration of Births and Deaths Act of 1890. During the last twenty years it has been 24 per 1,000 of the population. In Dublin in the decade 1876–1885 it was 29, and in the last ten years 28.

Marriages have declined. In London in the ten years ended 1860, the marriages per 1,000 of the population were in the ratio of 20·6; in the decade ended in 1906 the number fell to 17·8. The unmarried males, 20 years and upwards, in England in 1871 formed 27 per cent. of all the males of those ages, but in 1901 the percentage rose to 37. In Ireland the percentages were 38 in 1871, and 48 in 1901. Scotland shows a better state of things, the numbers being 33 in 1871, and 37 in 1901.

It is strange that the greater percentages of unmarried adults should be amongst the well-to-do classes. It would seem that a man's desire to marry is inversely to his means of maintaining a family. A very small proportion of beggars are unmarried. On the other hand there are hundreds of thousands of mature bachelors with pecuniary resources for two and more people. I think all bachelors over 25 years who pay income-tax, should also pay a special tax. In that way a fund might be raised to help to provide the proposed old age pensions. An American misogynist has defined an old bachelor as a mule who shirks his load. I dissent altogether from this definition. On the contrary, I would say that the load of some kind or other which every man has to carry would be lessened in weight if shared by a woman. I think evidence of the advantages of the connubial condition is shown by the fact that the proportion of widowers to the male population does not increase, whilst the proportion of bachelors is steadily increasing. A larger proportion of

widowers marry again than bachelors of the same ages. This is a proof of the advantages of matrimony.

It is gratifying, also, to learn from vital statistics that the mean expectation of life of a benedict is several years longer than that of a celibate of the same age.

SANITARY STATE OF DUBLIN.

An address to a Sanitary Conference in Dublin should include some account of the state of public health in it, and of its public health organization and vital statistics. I shall make this account a brief one. The City of Dublin contains a population estimated in this year to be 300,691. Together with four townships it constitutes the Dublin metropolitan registration area of the Registrar-General, which contains a population of 390,691. In comparing the vital statistics of Dublin with cities like London, those of the city alone are often taken, not those of the whole registration area, which really include the suburbs of the city.

Forty years ago the sanitary staff of the Corporation of Dublin consisted of the whole of one man (an inspector of nuisances) and a small part of another man (the secretary of the markets' committee). Now the staff includes a medical superintendent officer of health, who is also executive sanitary officer and public analyst; 20 *ex-officio* officers of health, who are the Poor Law medical officers; an assistant executive sanitary officer; a veterinary surgeon; 2 building surveyors; a superintendent of sanitary sub-officers (sanitary inspectors); 32 sanitary sub-officers; 6 lady sanitary sub-officers; 2 inspectors (one a lady) under the provisions of the Shop Hours and Shop Assistants' Seats Act; 3 inspectors of food under the Public Health Acts; 2 inspectors of food under the Sale of Food and Drugs and Margarine Acts; an inspector of slaughter-houses; caretaker of refuge for persons whose dwellings are being disinfected and persons who have been in contact with cases of infectious disease; 12 clerks; caretaker of smallpox hospital; 6 labourers; a superintendent of disinfecting department and a staff of 23 disinfectors, ambulance men, drivers, whitewashers, and charwomen. The total number of persons employed in the Public Health Department, and including the superintendent and staff of the Corporation baths and house, is 112.

This large staff has for main objects the betterment of the sanitary condition of the city. Perhaps in no other city in the United Kingdom is the work of the sanitary department more extensive and difficult. A hundred years ago Dublin was the largest town in the United Kingdom outside London; now it is exceeded in population by six cities, which,

during the hundred years, have grown from moderate size to enormous proportions. They are comparatively new as regards their houses, but the Dublin of 1907 is much the same as regards its residential houses as it was in 1807, except that the houses formerly occupied by single families are now largely tenement houses, and are so old that it is difficult to keep them in repair. In these houses 37 out of every 100 families in Dublin occupy each a single room. In many English towns not 10 per cent. of the families are occupiers each of a single room. The poverty of a large proportion of the people is shown by the fact that whilst about 16 or 18 per cent. of deaths in English towns occur in workhouses, hospitals, and other institutions, more than 40 per cent. of the deaths in the city of Dublin take place in these institutions. One-third of the inhabitants of Dublin are not natives. Many of the persons who have come to Dublin from the country have not added to its wealth or health. The Dublin hospitals are largely supplied with country patients.

It is not fair to compare a city which, as in the case of Dublin, contains an abnormally large poor population, with cities like London, in which there are higher standards of wealth and comfort. Dr. Sergeant, in a paper published in the *Journal of the London Statistical Society*, June, 1864, contended that in comparing the death-rates of London and Birmingham an allowance of 1·5 should be made in favour of Birmingham, on account of the comparatively small proportion of the affluent classes who inhabit it. A greater allowance should be made in favour of Dublin when comparing its vital statistics with those of London. Amongst the rich everywhere there is a high standard of health; amongst the poor in every town there is a lower standard. Although Glasgow has been brought, on the whole, by sanitary measures into a very healthy city, yet Dr. Chalmers, medical officer of health for that city, has shewn that in some of its streets, occupied by very poor people, the death-rate has exceeded 40 per 1,000.

In 1906 the expenditure of the Public Health Committee amounted to £15,593, and the revenue, including the liberal contribution of £2,091 from the Local Government Board, was £4,339 9s. 4d. A large proportion of the expenditure is in relation to the maintenance of fever patients, payment for notifications of infectious diseases, fees to the registrars of Cemetery Boards, working the Act relating to the street trading of children, contributions towards the maintenance of open spaces, proportion of law agents and accountants' expenses, expenses in connection with the Contagious Diseases (Animals) Acts, and in providing dwellings for the working classes. The Corporation have expended £485,000 in clearing unhealthy

areas, and a very large sum in the erection of baths, wash-houses, refuse destructors, abattoirs, etc.

The Corporation of Dublin have expended £345,000 in providing dwellings for the working classes, and a large sum in the erection of baths and wash-houses, abattoirs, and a disinfecting house refuge for persons whose residences are undergoing disinfection or who have been in contact with cases of infectious disease. A sum of considerably over half a million has been expended in main drainage works, designed to free the river Liffey from pollution and to prevent the blocking of the street sewers. They maintain, as I have shewn, a large sanitary staff. Have there been any substantial results to justify so great an expenditure? There have been good results; very good as regards the lessening of zymotic diseases, but it is somewhat disappointing that the general death-rate has not been reduced to a greater extent. As I have already said, this may be owing to so large a proportion of the population coming under the heading of the very poor. Still, I think the following statistics will show that the money spent upon improved sanitation has produced a good result:—

	General Death rate.		Zymotic Death-rate.	
	Dublin City.	Dublin Registration Area.	Dublin City.	Dublin Registration Area.
Mean of Ten Years—Period 1879 to 1888.	31·5	28·6	4·2	3·8
Mean of Ten Years—Period 1889 to 1898.	28·9	26·0	2·9	2·5
Mean of Five Years—Period 1899 to 1903	28·1	25·7	2·9	2·5
Mean of Three Years—Period 1904 to 1906	23·7	22·3	2·0	1·8

In 1906 the zymotic death-rate in Dublin was below that of the 67 largest English towns, and even below that of London.

It has been shewn that before the Irish Public Health Act, 1878, 11 per cent. of the deaths were not registered, the recorded deaths being 11 per cent. under the burials. The death-rates for years up to 1898 were 11 per cent. greater than recorded.

Correcting the incorrect death-rates for the years before 1898 by adding 10 per cent. to the registered deaths, the high death-rate in the Dublin registration area was still greater.

The mean death-rate in the years 1905 and 1906 was 23·2, and in the Dublin registration area 21·95.

These figures shew that in the last two years the city death-rate was 11·4 per 1,000, and the registration area death-rate 10·5 per 1,000 below the rates in the decade ended in 1888. The decline in the rates was greater in the city than in the townships.

Decline of Typhoid Fever.

Dublin is built partly on stiff boulder clay, partly on loose gravels. Having studied the incidence of typhoid fever in Dublin for many years, I ascertained that the disease prevailed to a greater extent in the districts on the gravels than it did on the clays. This seemed to me to indicate a connection between the soil and the disease. It appeared to me that the disease was of semi-malarial character, and that the micro-organism causing it might for a time exist in filthy soils. Some years ago Dublin was largely a midden city; but since I became chief medical officer of health incessant efforts have been made to adopt the water carriage system of filth removal, and now Dublin has practically got rid of the objectionable midden system, a system which, existing still in some English towns, helps to raise their death-rates.

Some years ago Dublin had the highest death-rate from typhoid fever amongst the towns in the United Kingdom with the exception of St. Helens in Lancashire. Now, as the following table shows, typhoid fever is an insignificant factor amongst the causes of death.

Deaths from enteric (typhoid) fever per 10,000 of the population.

	Number of Deaths.	Rates of Death per 10,000 of the Population.
1891	127	5·2
1892	91	3·3
1893	218	8·8
1894	104	4·2
1895	80	3·2
1896	101	4·2
1897	128	5·0
1898	135	5·5
1899	132	5·3
1900	99	4·0
1901	85	2·9
1902	98	3·3
1903	73	2·4
1904	61	2·0
1905	40	1·4
1906	44	1·5

In 1906 fifteen persons out of every 100,000 died from enteric fever.

TUBERCULOSIS.

The various forms of tuberculosis cause a large proportion of the deaths which occur in Dublin. In 1906 there were 937 deaths from tuberculosis of the lungs, or in the ratio of 3·15 per 1,000 of the population. The deaths from all forms of tuberculosis numbered 1,386, or in the ratio of 4·71 per 1,000 persons living.

It is remarkable that whilst all other diseases, of which the *materies morbi* consists of pathogenic micro-organisms, have greatly declined in Dublin, tuberculosis, which belongs to that class, continues unabated. It is clear that something more than the agencies which have reduced the other diseases of that class is required to combat this "white peril," as it has aptly been termed. The compulsory notification of the disease, the establishment of hospitals for hopeless cases, and of sanatoria for possibly or probably curable ones, are among the preventive measures which should be adopted. The diffusion of literature and delivery of lectures relating to the disease, and how patients suffering from it should be treated, would be useful. Volunteer health lady visitors and lady sanitary inspectors could do much in teaching people general principles of hygiene, which, if strictly observed, would lessen the chance of tuberculosis being caught; for truly it is an infectious malady.

Her Excellency the Countess of Aberdeen, who always gives her active and powerful aid in the initiation and progress of good works, has recently, in conjunction with Mrs. Rushton, established a National Health Association to be worked by women. Its chief objects are to lessen the causes which produce tuberculosis and the present high infantile mortality. The Association deserves and will, I am sure, receive adequate support.

SANATORIA FOR CONSUMPTIVES.

In many parts of England Sanatoria for consumptives have been established. In July, 1906, a Conference of sanitary authorities of the City and County of Dublin was held in the office of the Public Health Committee, to consider a proposal to establish a Sanatorium for the Consumptives of the City and County. The subject was also discussed at several subsequent meetings. The Conference received information from English and Irish sanitary authorities in reference to the cost of equipping and maintaining Sanatoria. They obtained estimates of the cost of buildings of large size, and of small ones (chalets) used in various Sanatoria. They also made estimates founded on the figures obtained in reference to existing Sanatoria. On these data the Conference came to the conclusion (1) that it was desirable to establish a Sanatorium for

Consumptives belonging to the poorer classes; (2) That the Sanitary Authorities of the City and County should combine to found such an institution on such a site as experts would approve of; and (3) that it should be on the chalet system which, whilst at least equal to any other, was the cheapest.

A rate of one penny in the pound on the valuation of the City and County of Dublin would realise about £6,500 in round numbers. With this sum an effective establishment would be formed in the first year, and about forty patients admitted in the second year. It was hoped that subsequently, from various sources, a sum would be available sufficient to further extend the accommodation, and maintain about sixty patients. The advantages of the chalet system are that it readily admits of extension at very little additional expense.

These estimates were based on the presumption that all the sanitary authorities would join in founding the sanatorium.

After many conferences and much discussion, the following sanitary authorities agreed as to the necessity of forthwith establishing a sanatorium under the joint management of representatives of the authorities going into the scheme, namely, the Corporation of the City of Dublin, the Urban Council of Kingstown, the Rural District Councils of North Dublin, South Dublin, Balrothery, and No. 2 Celbridge Rural District.

The following authorities decided not to enter the combination:—The Urban Councils of Rathmines, Pembroke, Blackrock, Dalkey, and Killiney.

The Local Government Board for Ireland have intimated their intention to frame a Provisional Order to carry out the proposed scheme, and power will be given to admit the dissentient authorities whenever they may subsequently wish to enter into the combination.

The Milk Supply.

As regards the milk imported from the country, it is to be feared that little, if any of it, comes from farm-yards subject to sanitary supervision. In the rural districts the trifling salaries paid to the *ex-officio* medical officers (the Poor Law medical officers) are not calculated to make them enthusiastic sanitarians. From inquiries which I have made I have come to the conclusion that the hygienic supervision of the rural sources of milk might be expressed by the word *nil.* It would be a great step in the direction of the improvement of the hygiene of the dairy if the supervision of dairy-yards in rural districts were vested in the Department of Agriculture and Technical Education. Their staff of nearly fifty veterinary

surgeons, augmented by a sufficiently large addition of veterinaries, would exercise a useful supervision over these country farms from which the cities and towns derive part of their supply.

I have examined many specimens of milk coming into the city from the country, and have found that on the whole they were not nearly so clean as the milk from the Dublin dairies, which are under the inspection of a veterinary surgeon and four inspectors.

The greatest care is necessary to protect milk from pollution. As the air teems with micro-organisms, the more the milk is exposed to it the greater will be the number of micro-organisms present in it. The danger is that some of them might be pathogenic (disease producing). It is for this reason that I have always thought it necessary that the milk on retail should be covered up, except whilst being dealt out to purchasers. It is, however, in the dairy-sheds where milk is most likely to get polluted; hence the urgent necessity for cleanliness there, and for the least possible exposure of the milk to the air.

The importance of keeping milk as cool as possible is well shown by an experiment made by Parke. He found that a specimen of milk procured under conditions most likely to prevent impurities getting into it, yet contained 2,400 bacteria per cubic centimetre (about 15 drops), when kept at 32° F. for 24 hours. After 48 hours the number declined to 2,100, and after 168 hours to 1,400. Ordinary market milk kept for 24 hours at 32° had 30,000 micro-organisms per cubic centimetre, but on keeping at that temperature for 168 hours the number declined to 19,000

Market milk which, after 24 hours at 46° F., contained 42,000 bacteria per cubic centimetre, included in that quantity 12,200,000 after 96 hours. A specimen of market milk kept at 68° F. had its bacteria increased from 4,000,000 to 25,000,000,000 in 48 hours. It is amazing that so many millions of living vegetable organisms (for such are bacteria) could find room in 15 drops of milk, but the size of a bacterium is extremely small, visible only by means of a powerful microscope. Minute as micro-organisms are, what havoc amongst mankind and the lower animals do they not cause!

In some English towns municipal depots have been established for the purpose of supplying pasteurised milk for children. Dr. Hope, the distinguished Medical Officer of Health for Liverpool, reports favourably as regards the improvement of the health of children in that city supplied from municipal pasteurised milk depots. The milk, however, costs the city much more than it received for it, the annual loss being about £2,000. There is not unanimity of medical opinion as to the desirability of pasteur-

ising or sterilising milk, especially as to sterilising, but the great majority of medical men seem to be in favour of at least the pasteurising process.

By pasteurising, the milk is heated for 10 to 15 minutes to a temperature of from 150° to 158° Fahr., and is then rapidly cooled in order to preserve its flavour. This process is expected to destroy dangerous micro-organisms, and probably, as a rule, it does so; but various authorities have pointed out that it is not always certain to destroy microbes, especially those of tuberculosis. Some authors believe that the alteration produced by heating the milk depreciates its nutritive value as food for infants. The albumen becomes less soluble and the milk less easy of digestion. The use of pasteurised milk by children over one year, and by adults, seems desirable, for although the milk might not invariably be the vehicle of poisonous microbes, yet the chance that the latter might be present is greatly lessened.

To sterilise milk so as to insure the certain destruction of pathogenic micro-organisms it is necessary to employ a temperature of 248° F., which can only be done in close vessels. The character of the milk is much altered by this process. Some of the casein (cheesy matter) is precipitated, and the peculiar sugar of milk is altered.

Boiling milk produces an action intermediate between pasteurisation and sterilisation. It is certainly better to boil milk intended for infants when it is becoming sour, or when it has been exposed to the danger of infection or pollution.

The preservation of milk by salicylic acid, boracic acid, or formalin, is objectionable, but it seems to be rarely practised in the case of the Dublin milk, as I have seldom found any of them present.

The preparation of "humanised milk" is carried out in a few English districts. The milk is pasteurised and prepared so as to resemble, as nearly as possible, human milk, and is placed in sterilised bottles. I fear if such milk were on sale in Dublin it would not be purchased by the poor. It is my firm belief that the infants of the poorer classes do not, in a great many instances, get sufficient ordinary milk. If the societies who take an interest in the welfare of children undertook to provide poor mothers with proper feeding bottles for their "spoon-fed" infants they would do a good work. If the lady sanitary officers had the power of ordering a supply of milk for infants obviously underfed, much infantile life would be preserved. In concluding this subject, I may say that, even in the case of milk intended to be pasteurised, the cleaner it is the better.

Infantile Mortality.

It is a sad fact that one fourth of the deaths which occur in the 76 largest English towns are of infants under one year of age. In 1906 the infantile death-rate in Dublin was exactly the mean rate in the 76 largest towns, excluding London, namely, 4·3 deaths per 1,000 of total population. In the relation between deaths and births Dublin was better than the English towns, the deaths being 146 to 1,000 births, whilst in the English towns the ratio was 151 deaths to 1,000 births. In the 76 great towns, including London, the deaths were 145 to 1,000 births, or practically the same as in Dublin.

A singular point in connection with the Dublin infantile mortality is that the deaths are less than a fifth of the deaths at all ages, whilst in the English towns they are more than a fourth of the total deaths. The high death-rate in Dublin is therefore not due to a relative high infantile mortality or zymotic rate, but to a high rate amongst the adult population. In the English large towns the infantile death-rate ranged from 85 in Hornsey to 212 in Burnley.

The three great problems demanding solution are: How is the terrible mortality of children to be lessened? How are the ravages of tuberculosis to be minimised? How are the very poor to be provided with healthy dwellings? The efforts of all such associations as The Royal Sanitary Institute, of the public health authorities, of the legislative and administrative bodies of the State, and of the people at large, should earnestly strive to solve those momentous questions.

In concluding this hastily written and imperfect address, I have to express the thanks of the Council of The Royal Sanitary Institute to the Provost and Senior Fellows of Trinity College who so kindly permit us to meet in their ancient and splendid College, which I trust will have a future as brilliant as its past has been. We are glad too that the College is presided over by a distinguished Irishman, Dr. Traill, who has always taken the deepest interest in medical and sanitary affairs.

SPEECH

By HIS EXCELLENCY the EARL OF ABERDEEN,
Lord-Lieutenant of Ireland,

Conference at Dublin, Wednesday, June 26th, 1907.

AT the dinner to members of The Royal Sanitary Institute at Trinity College, Dublin, THE PROVOST, who presided, proposed the health of the King, and afterwards, "The Royal Sanitary Institute."

THE LORD LIEUTENANT responded to the toast. His Excellency said that the task entrusted to him was a responsible, but also a very congenial one. They would all join in welcoming the members of the Institute, recognising the valuable public work in which the Society was engaged. It had been mentioned that twenty-three years had passed since their previous visit to Dublin. This period was only a little longer than that which had passed since his former official residence in Dublin, and, therefore, they might, as it were, compare notes as to the changes in regard to the subject of public health which had taken place.

There had undoubtedly been a considerable advance and improvement, and for some of the most notable features of this progress they must offer a tribute of appreciation to the Corporation of Dublin. He referred, for instance, to the system of drainage which had recently been completed. That was a fine work which could not fail to be of far-reaching benefit. He would also refer to what had been done in the matter of removing insanitary buildings and erecting suitable dwellings. In this respect a large amount had been accomplished: as, for instance, at St. Patrick's Park, and also in regard to the operations on the North side of the city. Side by side with municipal activity in this matter, there had been a fine example of private munificence and public spirit in regard to extensive and beneficial work accomplished by Lord Iveagh, who had provided a large amount of excellent housing accommodation, and also market accommodation of a most effective kind. The Dublin Artisan Company had, on a somewhat different basis, also been carrying out useful work.

The importance of health from a public and patriotic point of view was being increasingly recognised. It was largely a question of educating public opinion, and that was what The Royal Sanitary Institute was promoting. In view of this they would recognise all the more the appropriateness of the action of Trinity College in taking so leading a part in welcoming the members of the Institute and giving them every facility for their transactions, and promoting the interest and enjoyment of the visit. Nor could it be forgotten that Trinity College was one of the first of the learned institutions to grant Diplomas in Public Health. His Excellency further remarked that there was one aspect of the whole subject to which he wished to allude before concluding, namely, the migration from the country into towns which was going on, not only in the British Isles, but in most countries of Europe. He would not pause to discuss the causes of this movement, but he referred simply to the fact, and it was one with which the question of public health was associated. The circumstances of town life, especially in the poorer neighbourhoods, necessarily entailed certain drawbacks. These were certainly in some degree mitigated by the importation of country folk who usually brought in superior physical stamina, and so forth, and what they had to do was to see that the comparatively healthy element thus brought in was, as far as possible, sustained, *i.e.*, that people in the towns (and especially the rising and growing generation) should be provided with those essential requirements for health, pure air, pure water and pure food.

They must endeavour also to secure that the incoming element from the country to the town should previously have been protected from injurious surroundings. People living in the country, of course, could not avoid inhaling a good deal of healthy air, but the sanitary conditions of actual living were often sadly defective. Such reflections made them realise afresh the value of the work of such a society as The Royal Sanitary Institute.

THE DISPOSAL OF THE SEWAGE OF SEASIDE TOWNS.

By J. T. C. NASH, M.D., D.P.H.,

Medical Officer of Health, Southend-on-Sea.

(MEMBER.)

THE question of sewage disposal is a very large one bristling with difficulties, and though an important Royal Commission has been sitting on the subject for several years, no final recommendations as to methods of treatment are yet forthcoming from the Commissioners in spite of their vast labours.

There are in my opinion no very serious objections to the present methods of disposal by discharge into the sea which are not also applicable to treated sewage, but there are some minor ones chiefly of an æsthetic or sentimental nature.

The only serious objection that can be made, where the outfall is carried well out to sea, applies to sewage effluents as well as to crude sewage (though perhaps in a lessened degree), and that is bacterial injury to fish. Were sea-coast towns to spend huge sums of money on some of the most approved modern methods of treatment, the effluent would still be "potentially dangerous," as stated by the Royal Commission on Sewage Disposal in their "Fourth Report on the Pollution of Tidal Rivers, with special reference to contamination of shell-fish." The following significant sentence occurs in this Fourth Report of the Commissioners:— "The treatment of sewage, according to methods at present in use, cannot be relied on so to alter its character as to allow of its discharge in the immediate neighbourhood of shell-fish layings without incurring appreciable risk of disease being communicated by the consumption of shell-fish taken from such layings."

Whether it be the sewage of an inland town or that of a seaside resort, the questions involved as to the disposal of sewage are very intricate, and "due regard must be had in each case to the extent of the evil, to the possibility of providing a remedy, and to the cost."

The first question then is as to the extent of the evil. In the case of an inland town this is generally a very serious question indeed. The evil is great, and must somehow or another be, to some extent at least, remedied by some method of sewage treatment.

In the case of a sea-coast town, the provisions of nature are such that no serious evil need exist, provided that the outfall is carried sufficiently far from the shore at a position indicated by careful examination of currents and tides by means of float experiments or by other accurate observations.

If the grosser suspended solids are kept back by the simple means of screenings, these can be burnt or dug into the ground forthwith. The dissolved solids then pass out into the sea; some of these are at once precipitated by the salts contained in the sea-water; the remainder meet with enormous quantities of dissolved oxygen contained in the constantly changing huge volumes of sea-water, and are rapidly oxidised and purified.

If crude sewage or a sewage effluent is discharged into a narrow creek on a falling tide so that it does not meet with *changing* quantities of fresh sea-water charged or saturated with oxygen, but on the contrary forms a larger and larger proportion of the water in the creek as the tide ebbs, it is obvious that such a sewage or effluent does not and cannot immediately meet with sufficient quantities of dissolved oxygen to oxidise its organic matters forthwith, and will not do so until the next tide begins to flow.

If, on the other hand, it enters the sea or a broad estuary several miles in width, even though it be the untreated sewage of a very large town, its comparative quantity is very small as compared with the mighty changing volumes of water into which it is gradually discharged. The value of the fact that it is discharged into a vast restless moving body of water is also not to be ignored. In consequence of this each volume of sewage enters a fresh and much larger volume of clean water, which experiments have shown to be freely supplied with dissolved oxygen.

The truth of the matter is that the sea provides an inexhaustible supply of dissolved oxygen. We have already seen that the object of bacteria contact beds is to secure oxidation of sewage. *In the sea we have, in my judgment, moving liquid contact beds providing all the oxygen necessary for oxidation.*

Where then the diluting fluid is thousands of times greater in volume than the sewage (crude or effluent) entering it, the dissolved oxygen in the diluting water is amply sufficient to effect oxidation, but in this process many creatures, macroscopic and microscopic, assist, and it is really

astonishing how rapidly all traces of sewage matter disappear. Where unscreened sewage is entering the sea a few small fœcal masses may float like corks on the water for varying distances, but even these eventually dissolve and disappear. Still as this takes time it is obviously advantageous to remove such solid particles by means of screening before discharging the sewage.

In certain sea-coast towns a nuisance indirectly arising from the discharge of sewage is occasionally met with. This arises from the growth of large quantities of sea-weed, particularly a sea-weed known by the name of *Ulva latissima.* Professor Letts, of Belfast, has carried out some very valuable experiments in connection with this sea-weed, and has shown that it is a natural purifier of a sewage-polluted sea-water, itself giving out oxygen and absorbing large quantities of nitrogen. For this latter reason, if the sea-weed collects in large quantities and is thrown up on to a foreshore, and is there exposed to the rays of the sun, it putrefies rapidly, giving rise to an almost intolerable stench.

Professor Letts in two valuable reports has shown that this sea-weed can absorb nitrogen either from free ammonia, which is abundant in both treated and untreated sewage, or from nitrates which are found, and indeed are required to be found, in a good sewage effluent after treatment.

Chemical examinations carried out by myself and others show that there is very little free ammonia in the water of the Thames about the position where this sea-weed is tending to accumulate, but one would expect the water of a river like the Thames to be bringing down considerable quantities of nitrates, which indeed are quite appreciable in the estuarial waters.

It will be understood from what I have already said, that provided the growth of this sea-weed can be kept within bounds and the weed prevented from being cast up on the foreshore in large quantities, it is really a useful scavenging or purifying agent in any polluted water.

Were it, however, to grow too profusely and not be kept under control, and were it to be cast up on the foreshore within reach of the tides, it might in the hot months give rise to an undoubted nuisance in the way of an almost intolerable stench.

Professor Letts suggests that it might be possible to utilise the sea-weed *Ulva latissima* as an agent for the final purification of sewage by means of an "Aquatic Sewage Farm." This suggestion appears to me to be scientifically (and I hope practically) an excellent one. There can be little doubt that these green sea-weeds are among the purifying agencies which nature has designed for dealing with sewage in sea-water.

Acting on this idea he has recommended that tanks or ponds could be constructed on the flat Slob lands of Belfast so as to contain sea-water and living *Ulva latissima.* The tanks could be made tidal in their action, and any excess of growth of the *Ulva* could be dealt with by removal. Such *Ulva* indeed would form an excellent manure, as the value of a manure depends chiefly upon the amount of nitrogen, phosphoric acid, and potash salts which it contains, and more especially the proportions of the two former.

Letts has shown that the *Ulva* may be considered to be almost equivalent to a sample of farmyard manure in respect of phosphorus, while greatly superior to it as regards nitrogen. Farmers would thus find the cost of carting a remunerative investment.

I have not heard whether his suggestion has ever been acted upon, and his final report has not yet been published; but he kindly informs me that a long and detailed report by Dr. Adeney and himself on the pollution of estuaries and tidal waters (for the Royal Commission on Sewage Disposal) is now in the Press.

In certain cases it might be possible to consider a site for a refuse destructor in connection with a proposed sewage scheme, for the heat generated by the destruction of the refuse might be utilised for pumping purposes, and the clinker might come in useful in various ways, as for instance for making a contact bed, should it be decided to further treat the sewage before discharging. On a flat shore such a bed might be constructed on the flats, and be made tidal in action; the idea would then be rather to use such a bed more as a mechanical than as a biological filter, though I think it would not altogether lose its biological qualities even if flushed with sea-water daily. The effluent from such a bed could then pass through an *Ulva* lagoon, as suggested by Letts, and so to the sea.

Letts very kindly writes me: "While these (green) sea-weeds are admirable purifiers in relation to soluble impurities such as ammonia, they of course do not affect the solids in suspension, nor do they diminish the amount of albuminoid matters. Therefore they could only be used as a method of treatment in very special cases."

It is worth noting that a ton of sulphate of ammonia, a valuable commercial product worth about £11 per ton, can be obtained from 14 tons of the dry sea-weed, whereas it requires 25 tons of coal to give the same quantity. It seems possible therefore that an aquatic sewage farm might prove to be a profitable undertaking.

The method of disposal of sewage that would seem to be sufficient for a sea-coast town would thus be (1) screening off of grosser solids; (2)

precipitation and liquefaction in tanks of sufficient size to hold a day's dry weather flow. This would permit of partial anaerobic bacterial treatment and consequent breaking down of the contained organic matter; (3) the effluent to be discharged at an outfall sufficiently far from the shore. In no case should the outfall terminate on the foreshore. It should always be covered with water, even at low water of spring-tides.

If further treatment on the lines indicated could be carried out, it would appear that a satisfactory effluent might be discharged, and possibly at small expense, or even at a profit in time. The method appears to be worthy of experimental trial in *suitable* cases.

I do not think that sea-board towns should be saddled with the cost of expensive methods of treatment such as are unfortunately necessary in the case of inland towns. The sea in itself constitutes better oxidising contact beds than any expensive artificial contact beds, but sentiment if nothing else calls for some preliminary reduction of impurity prior to discharging sewage even into the sea, and the forthcoming reports of Drs. Letts and Adeney should prove of great interest.

Among the unsolved problems in the disposal of the sewage of large towns, are the questions of overflow and of storm water in times of rain.

If ever the time comes when the horse and the dog are tabooed in cities, the storm water problem will have shrunk into comparative insignificance; but as long as horse traffic predominates, the first washings of streets in times of storm, after a period of dry weather, must be indescribably filthy.

In my judgment the first washings of streets should always reach the main sewers.

DECISIONS OF COUNCIL ON RESOLUTIONS PASSED AT DUBLIN CONFERENCE.

RESOLVED that this Conference is of opinion that it would be desirable to have County Medical Officers of Health, with a sufficient staff of qualified Sanitary Inspectors, appointed for Ireland, and that the Council of The Royal Sanitary Institute be requested to take steps to urge this opinion upon the consideration of the Government.

The Council decided to communicate this resolution to the Chief Secretary for Ireland.

RESOLVED that the group of conditions now recognised under the term "Pretuberculous" is deserving of more attention than it has hitherto received in these countries, and that this Conference recommends the Council of The Royal Sanitary Institute to direct the attention of Medical Officers of Health and Sanitary Authorities to the question.

The Council decided to publish the Resolution in the JOURNAL for the information of the medical members of the Institute.

OBITUARY.

Sir Benjamin Baker, K.C.B., K.C.M.G., LL.D., F.R.S., M.Inst.C.E.

(VICE-PRESIDENT.)

It is with deep regret that we announce the sudden and unexpected death of Sir Benjamin Baker from heart failure, which occurred at his residence, Bowden Green, Pangbourne, on Sunday, the 19th May. The roll of British Engineers has been deprived of one of its most eminent and illustrious members. His birth took place at Tondu, Glamorganshire, on 31st March, 1840, so that at his death he was but sixty-seven years old.

He was apprenticed to Messrs. Price and Fox, of the Neath Abbey Iron Works, South Wales, where he gained that practical knowledge with the properties of iron and steel which served him in good stead in later years. On leaving Neath Abbey Works he spent two years as Assistant to Mr. W. Wilson, then engaged on the erection of the Victoria Station and the Grosvenor Road Railway Bridge.

In 1862 he began that association with the late Sir John Fowler which endured till the death of the latter in 1898. In 1867 he contributed two remarkable series of articles to *Engineering* on "Long Span Bridges" and on the "Strength of Beams," which were republished in book form in England, America, Germany, and Austria. In 1869 Mr. Baker was entrusted by Mr. Fowler with the construction of the District line from Westminster to the City, a particularly difficult and expensive piece of work.

At the conclusion of this he went in place of Mr. Fowler to Egypt, when the Khedive was contemplating the construction of a combined irrigation and ship canal between Alexandra and Cairo. Complete preliminary plans were prepared for this gigantic project, the magnitude of which greatly exceeded that of the Suez Canal.

A peculiarly difficult problem was presented in this connection by the necessity of crossing at Cairo the river Nile, the level of which varies enormously with the time of the year. A complete solution of this prob-

lem was evolved, but as steamers specially designed for the transit of the Suez Canal were then beginning to be built in quantity, the new scheme was not proceeded with. Mr. Baker's name first became familiar to the general public on the transport of Cleopatra's Needle to this country in 1878. This was accomplished by enclosing the obelisk in a cylindrical iron vessel, and then rolling the whole into the sea and towing it to London by means of tugs. All the details of this operation were devised by Mr. Baker. The Mediterranean was safely traversed, but a storm of exceptional severity led to the abandonment of the vessel containing the obelisk in the Bay of Biscay. It was recovered and ultimately reached the Thames.

The inauguration of the great Forth Bridge undertaking in 1881 brought Mr. Baker still more prominently before the public. The necessary Act was applied for in 1881, and the carrying out of the work entrusted to Mr. Fowler and Mr. Baker, who were now in partnership. For the next few years Mr. Baker practically lived on the works, and began in connection with them a series of most interesting experiments on the mechanical properties of structural steel, the results of which were partially embodied in the notable address he delivered as President of the Mechanical Science Section of the British Association in 1885.

Sir Benjamin Baker was made a K.C.M.G. at the opening of the Forth Bridge, his colleague, Sir John Fowler, being at the same time created a baronet. He was joint engineer with Sir John Fowler for the Central London Railway and Consulting Engineer for the Baker Street and Waterloo Railway.

One need not dilate on the successful results obtained with the shield system of tunnel driving through doubtful strata, which, as exemplified in the earlier tubes, led to its general adoption.

In 1895 Sir Benjamin Baker was elected to the Presidency of the Institution of Civil Engineers, and delivered one of the best among the many excellent inaugural addresses which have appeared in the minutes of the proceedings.

The greatest work with which Sir Benjamin Baker has been associated in recent years is the Assouan Dam. Its success was recognised by his being created a K.C.B., on the completion of the structure. Almost the last work on which he was engaged had reference to a further extension of the usefulness of this great undertaking, and after much study, whilst maintaining the present reputation of the structure as the strongest gravity dam in the world, Sir Benjamin Baker developed a system of reinforcements and additions which will practically enable the

capacity of the reservoir to be doubled. This design has been adopted by the Egyptian Government.

In 1890 he was elected a Fellow of the Royal Society, and at the time of his death was a Vice-President of that body.

Throughout his career Sir Benjamin Baker took a keen interest in the scientific problems associated with his profession.

As an arbitrator, he had to deal with a number of most important and difficult questions, and the thoroughness with which he investigated details, his conspicuous fairness and his sound common-sense caused his decisions to be received with respect, even by those who were not benefited by his awards.

By those who knew him intimately he will always be remembered as a true friend, and as a large-hearted man delighting to do kind actions in the most unostentatious way.

It has been the writer's privilege to be in his company on several occasions, and the impressions of these interviews will ever remain as some of the pleasantest he has ever experienced.

Sir Benjamin Baker never married, but lived at his residence, Bowden Green, Pangbourne, with his sister, Mrs. Kemp and her daughter, to both of whom he was devotedly attached, where he delighted to retire to the quiet of the country.

He was buried on the 22nd May, at Idbury, a small village in the Cotswolds.

Sir Benjamin Baker was a member of the Parkes Museum, and joined the Institute on the amalgamation in 1888, became a Fellow in 1899, and a Vice-President in 1904. He was much interested in the work of the Institute, and presided at several meetings.

I beg to acknowledge my indebtedness to the Editor of *Engineering* for much of the information given in this memoir. J. E. W.

NOTES ON LEGISLATION AND LAW CASES.

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FACTORY. — *Workshop — Exercise of manual labour — "Article" — Natural flowers made into bouquets—Factory and Workshop Act, 1901 (1 Edw. 7, c. 22), s. 149.*

The respondents carried on the business of retail florists, employed a number of young women and girls, whose duties consisted partly in serving customers in the shop, and partly in making up natural flowers into wreaths, crosses, and bouquets, and arranging floral decorations, for which purposes frames of wood or wire were sometimes used, in a room behind the shop.

Held, that the room was a place in which manual labour was exercised by way of trade in or incidental to the making of an article, or the adapting for sale of an article, within s. 149 of the Factory and Workshop Act, 1901, and that the room was, therefore, a workshop within the Act.

HOARE v. ROBERT GREEN, LTD. Div. Ct., 315. 2 K.B., July, 1907.

LONDON.—*Buildings not of uniform height—Gabled building—"Height"—"External wall"—New street—Width of street—Restrictions—Part—Alleged to offend—Method of measurement—London Building Act, 1894 (57 & 58 Vict. c. ccxiii), s. 5, sub-ss. 15, 21; s. 49—Attorney-General—Laches-Delay.*

In determining whether a building which is not of uniform height contravenes the provisions regulating the height of buildings contained in s. 49 of the London Building Act, 1894, the building must not be regarded as a whole, but each part alleged to offend against the Act must be treated and examined as if it were a separate building, and, for the purpose of ascertaining the height permitted by the section, the distance from the opposite side of the street of the front or external wall of the particular part under examination (whether the same is or is not the front wall of the building considered as a whole) must be measured from the point at which a line dropped vertically down that front or external wall would reach the ground level.

There is nothing in s. 49 to prohibit the erection of a building in a series of

steps or terraces, one behind the other, so long as the provisions of the Act are duly observed.

A narrow *cul de sac* in existence before August 7th, 1862, but which had been subsequently opened up into a thoroughfare and widened out.

Held to be a new street for the purpose of s. 49.

ATTORNEY-GENERAL v. METCALF & GREIG. Kekewich, J., 2 Ct. 23 (July, 1907).

SLAUGHTER-HOUSE. — *Licence — Local Government — Towns Improvement Clauses Act, 1847 (10 & 11 Vict. c. 34), s. 126.*

A licence for the use and occupation of a place as a slaughter-house granted under s. 126 of the Towns Police Clauses Act, 1847, is a personal licence, and expires at the death of the licensee, and does not enure for the benefit of subsequent occupiers of the place.

GOODWIN v. SALE. Div. Ct. 278. 2 K.B. (July, 1907).

STREETS. — *Channelling—By-laws—Validity of—Reasonableness—Uncertainty—Local Government—Construction of New Streets.*

A by-law of a Local Authority, dealing with the construction of new streets, provided that in all cases where the street was of a certain width the person constructing it should make on each side of it "a proper channel not less than twelve inches wide and six inches deep, either of granite cubes, laid on a bed of cement concrete at least six inches in thickness, or otherwise in a suitable manner and with suitable materials":

Held, (1) that the fact that the by-law did not give any power to the person constructing the street to object before some independent tribunal that the requirement was unnecessary in the circumstances of the particular case, did not make the by-law bad as being unreasonable; (2) that the liberty of making the channel in another manner, and of other materials than those specified, did not make the by-law bad for uncertainty.

LEYTON URBAN DISTRICT COUNCIL *v.* CHEW. Div. Ct. 283 (July, 1907).

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OF

THE ROYAL SANITARY INSTITUTE

CONFERENCE AT DUBLIN.

Section I.—SANITARY SCIENCE & PREVENTIVE MEDICINE.

POOR-LAW AND SANITARY ADMINISTRATION IN IRELAND.

By SIR CHARLES A. CAMERON, C.B., M.D., F.R.C.P.I., F.R.C.S.I., D.P.H.Cantab.

Chief Medical Officer of Health for Dublin.

(FELLOW.)

I FEEL complimented by being invited to preside at the Section of Hygiene at this Conference. I have been asked to open the discussion on the Poor-Law and Sanitary Administration in Ireland. These subjects would occupy the time of the section for weeks instead of a few hours in a single day. I think, therefore, I had better confine my remarks to one of these subjects, namely, Sanitary Administration, and leave subsequent speakers to discuss the other subject, Poor-Law Administration.

The Sanitary Acts are administered in Ireland by the following bodies:—1st, the Local Government Board, the supreme public health authority of the country; 2nd, the county boroughs; 3rd, the urban district councils; 4th, the rural district councils.

The Local Government Board has certain powers vested in it by statute, which enables it to supervise the boards of guardians who have charge of the pauper poor, sick or well. The Board must approve of the appointment and dismissal of officers of the guardians; its auditor examines their accounts and makes surcharges if payments of money have been illegally made. If the Board considers that the guardians have

neglected their duties, it may supersede them by the appointment of vice-guardians. The Board has much the same power in reference to the boroughs and urban and rural district councils. It must approve of the appointment and dismissal of sanitary officers, and of their salaries and increases of salaries. This practically secures fixity of tenure to the medical officers of health, who are appointed by the sanitary authorities, in which respect they are in a more secure position than the medical officers of health in England.

The Local Government Board contributes to the salaries of the sanitary officers of the local authorities. Dublin received last year more than £2,000 on account of the salaries of the medical superintendent officer of health and the sanitary sub-officers. For some years up to 1902 the Local Government Board paid one half of the salaries of the sanitary officers. In that year an Act of Parliament was passed, which fixed the contribution for that year as the maximum sum that in future could be given. As a result of this Act, the Local Government Board cannot contribute to the increases of salaries or to the salaries of new appointments, if by so doing its contribution would exceed the grant of 1902.

The borough councils are empowered to appoint medical superintendent officers of health, executive sanitary officers, and sanitary sub-officers (another name for inspector of nuisances, or sanitary inspector). They can establish hospitals and work them, or contribute to their maintenance, or do both. Dublin has a smallpox hospital in connection with its Sanitary Department. It has no Corporation general hospital or fever hospital, but it contributes between five and six thousand pounds annually to hospitals under private management. In addition, the Public Health Committee are empowered to pay for the maintenance of fever patients in the fever hospitals, or in the fever wards of the general hospitals. All the powers which Dublin and other county boroughs possess in reference to the appointment of sanitary officers and contributions to hospitals are also enjoyed by the urban and rural district councils.

The Irish Public Health Act of 1875 constituted all the poor-law medical officers ex-officio medical officers of health. They were paid by the boards of guardians; but when their districts were situated in towns having sanitary authorities, their salaries were fixed, though not paid, by those authorities. This anomaly ceased on the passage of the Irish Local Government Act, which transferred the payment of the salaries of the medical officers of health from the boards of guardians to the governing bodies of the counties and boroughs, and of the newly-created rural district councils. This Act transferred all the sanitary functions of the

boards of guardians to a newly-created set of authorities, termed rural district councils, whose functions are practically the same as the sanitary authorities of the towns. They are practically composed of the boards of guardians, but they have sometimes different chairmen and clerks. They pay the salaries of the ex-officio medical officers of health, sanitary sub-officers, etc.

It is now generally conceded that it was a mistake to have converted, *nolens volens*, the dispensary physicians into medical officers of health. Many of them disliked the new functions, especially as, with very few exceptions, their salaries were small, often only £10 a year. In 1900 a Commission was appointed by the Local Government Board to inquire into the causes of the high death-rate of Dublin. One of the recommendations was that an assistant medical officer of health should be appointed, and the sixteen ex-officio medical officers of health relieved of their functions. No authority in Ireland has the power to abolish the ex-officio health officers. It has been suggested that in the next proposed Dublin Improvement Act a clause should be inserted to discontinue their services. I doubt very much that Parliament would pass such a clause, for as a rule sections of general Acts are not in any important manner repealed by local Acts. In a general sanitary Act for Ireland, the ex-officio health officers might, of course, be dealt with.

One great difficulty in depriving the dispensary physicians of their sanitary functions is the question of compensation. They would only be dispensed with in the event of a new creation of medical sanitary officers, and it would be unfair to deprive them of their salaries without full compensation. If they were compensated by retiring allowances, then for many years to come the local authorities would have to pay a double set of medical officers of health. Most innovations and improvements are, however, attended with expense; but the abolition of the ex-officio health officers, and their replacement by whole-time officers, would (so far, at least, as rural districts are concerned) be worth the expense involved by it. So far as the large towns are concerned, the district medical officers of health perform, on the whole, very good sanitary work. In the rural districts they are handicapped very largely. They have not efficient sanitary sub-officers. The rural district councillors are practically the boards of guardians, who elect and pay them as dispensary physicians or medical officers of the workhouses. The health officers, whenever they make sanitary reports, are not unlikely to give offence to some one or other of the rural district councillors. This is particularly the case as regards the hygiene of the dairy and farmyard. A considerable proportion of the

milk supplied to the towns comes from the country. The sanitary sub-officer who is generally also the relieving officer, and who has a salary of only a few pounds a year, can hardly be expected to give much attention to the hygiene of the dairy and cowsheds. He is not qualified by the possession of a certificate of competency to act as a health officer granted by such bodies as The Royal Sanitary Institute. I think it may safely be assumed that in the greater number of the rural districts in Ireland the sanitary laws are practically a dead letter.

It would be most desirable that the Department of Agriculture and Technical Education should take over from the sanitary authorities the supervision of all places in which milk is produced. For the administration of the Diseases of Animals Act and the Orders relating to dairies and cowsheds, it has a staff of nearly sixty veterinary surgeons. By an increase of this staff and the appointment of inspectors not veterinary surgeons, but having some knowledge of rural sanitation, the health of dairy stock of the country and the purity of the milk would be far better attended to than they are at present.

Whether or not the ex-officio medical officers of health should cease to exist, the county council ought to be empowered to appoint medical officers of health and sanitary sub-officers. If the officers' functions ceased, the sanitary staff of the county would have to be larger than if there were no district medical officers. In England and Scotland, as well as in Ireland, there are district medical officers of health; but that did not prevent the establishment of county officers with powers to act in every district, and to review the proceedings of the local authorities.

Dr. C. L. Birmingham (Westport) said that there seemed to be a general idea that they in Ireland were in the rear as regards the laws of public health. He denied that. They had in Ireland the most skilful mothers to be found in any country, and they had a larger proportion of persons who took an advanced interest in sanitary science than could be shown to exist in other countries. For centuries the majority of the people in the rural districts had lived in the most squalid poverty. In one village of nine houses which he visited recently the only shelter for the cattle was in the dwellings of the people. Yet these people, because of their misfortune, instead of being looked on with an eye of pity, were described as "the dirty Irish." He disagreed with Sir Charles Cameron's statement that the sanitary laws in some places were practically a dead letter. The sanitary laws were being carried out instinctively by the people. He had never known a people so ready to follow advice on sanitary matters, but they would not be driven. He had no difficulty in establishing a

system of voluntary notification of tuberculosis by the patients' relatives. It was an invariable rule that when a person died of tuberculosis information was given and disinfection requested. The vaccination laws were carried out with the greatest promptitude. The mothers (in the West of Ireland at any rate) were sensible enough to bring their children to be vaccinated at a very early age. He would go a step further than Sir Charles Cameron in the reform of the system of medical officers. So great was the burden thrown on the medical officers that they were bound to close their eyes to a great deal. He was obliged to ignore the Home Office queries.

DR. EDWARD MAGENNIS (Dublin) complimented Sir C. A. Cameron and Dr. Birmingham on the pithy and admirable suggestions they had made, and as they had devoted themselves principally to sanitary administration, he dwelt mainly on poor-law administration. He complained of the delay in reform after the report of the Vice-regal Commission, and suggested that, as a protest, the local bodies should refuse to levy a poor-rate. An alternative scheme was outlined, which he had brought prominently before the public some years ago, and which contained suggestions that had since been adopted, and he explained that it wsa he who first drew public attention to the wretched condition of the lunatics in workhouses, and to the pernicious system of pauper nursing. He read extracts from the report of an expert on one of the workhouses, which showed the drains, etc., to be in a most defective and dangerous condition. This, he said, was a sample of these pestilential structures called workhouses and poorhouses. The poor could be better fed, better cared for, and much less demoralised by the system he advocated, and at about one-third of the present cost.

DR. AGNEW (Lurgan) said that the chairman in opening the discussion remarked that "it may safely be assumed that in the greater number of the rural districts in Ireland the sanitary laws are practically a dead letter." He did not think that there was any necessity to limit the chairman's observation to the rural districts. The Public Health (Ireland) Act had now been in force almost thirty years, and the special reports on the sanitary condition of the principal urban districts issued by the Local Government Board in a special supplement to their 1901 annual report showed that the observation was equally applicable to the greater number of the urban districts. Our 1878 Act was practically identical with the English Act of 1875, with such modifications as were necessitated by the different circumstances of the two countries. The Local Government Board was retained as the controlling power, and the dispensary district made the unit of administration, with the dispensary doctors as medical officers of health for their respective districts at a ridiculously small increase to their salaries for the discharge of their new and compulsory duties. The obvious intention of the Act, as laid down in the 2nd section, which constituted the dispensary doctors medical officers of health whether they liked it or not, was that the sanitary authorities should be encouraged and com-

pelled to appoint medical superintendent officers of health over larger areas, *e.g.*, the union or even a combination of unions who would act as shields over the medical officers of health, the efficient discharge of whose duties would inevitably land them in most undesirable situations, estranging their private patients, and placing barriers between the guardians and themselves which could only have one of two results, the rendering of the doctor's life so intolerable that he could not live in the district, or the scamping of his public health duties. Had it not been for this intention he believed that a very firm stand would have been taken by the dispensary officers themselves on the passing of the Act to prevent the new office being forced upon them, even though the miserable salaries which they were paid obliged them to look forward with eagerness to any additional remuneration as a godsend. However, they were doomed to disappointment, and the appointment of medical superintendent officer of health was reserved for the great cities of Dublin, Belfast, Cork, and Limerick. The Local Government Board, recognising to a certain extent the difficulties and anomalies of the situation, conceived the idea of creating an office called consulting sanitary officer, and calling upon every sanitary authority, with the exception of Belfast, Cork, and Limerick, to fill it up. By this means they defeated the object of the legislature, and superseded the appointments of medical superintendent officers of health, placing the sanitary organization of each district on such a basis that the whole Act would be practically a farce, and that nothing would be done in the whole of Ireland as regards sanitary matters than what had been done in the past, except that the dispensary doctors would be nominally medical officers of health, and for that would receive a nominal salary. The Treasury had, in accordance with the powers vested in them by the Act, fixed the remuneration of each sanitary officer as being not more than one quarter or less than one-sixth of their present salary; and as the average salaries of dispensary doctors were under £100 per annum, the amount given was usually from £16 to £20 per annum, whilst the salary of consulting sanitary officers was, as a rule, fixed at £10, and in a few instances they were paid by fee. The duties of the latter were defined by the Local Government Board as follows:—"To attend the meetings of the sanitary authority when required to do so, and advise them on all matters and proceedings requiring medical knowledge in the administration of the sanitary law." As a matter of fact, with the exception of a few urban districts where they actually insisted on doing their duties, these consulting sanitary officers never gave one pennyworth of value for the salary received. They, however, filled the post, and satisfied the requirements of the Local Government Board. It was no part of their duty to act as consultants to the medical officers of health on sanitary matters, although the general impression at first was that they were to take the place of medical superintendent officers of health. With regard to the appointment of dispensary doctors as ex-officio medical officers of health, he said he had already insinuated that if they had known the way they were going to be treated they would not have been so eager to accept

the appointment, but their miserable salaries were so ridiculously small and the exigencies of life such that they readily welcomed any change that would enable them to improve their method of living, and perhaps provide an occasional luxury, but the fixing of the limit of additional salaries by the Treasury very soon blasted their hopes, and the supineness and apathy of the Local Government Board demonstrated to them that whilst they received little yet very little would be expected of them, so that it would mainly rest with themselves whether they suffered in pocket or in feeling from a too vigorous discharge of their newly-imposed duties. In connection with the discharge of their public health duties by dispensary doctors, one of the strangest anomalies in the Local Government Board administration of the Act was the relationship which these doctors bore to the sanitary sub-officers in the large cities and in the remaining districts. In the latter all reports regarding nuisances, etc., were sent by these officers direct to the medical officers of health, who were bound to visit and report to the sanitary authority without delay; but in Dublin and Belfast the sanitary sub-officers reported directly to the sanitary authority, and the Public Health Committee issued instructions on the same; it was only in very rare instances that the medical officer of health was required to interfere at all, whilst his brother in the country was obliged to assist in all work. Now in a city like Belfast or Dublin the dispensary doctor ran no risk of knocking his head against one of his private patients, and perhaps very little of offending one of the guardians, but in other urban districts, as well as in all rural, every time the doctor felt called upon to recommend the abatement of a nuisance, or some sanitary improvement, he was sure to run across either some one who has been, or in the future might be, a private patient. Nearly all the owners of property lived in the district, and it was to these that he had to look for his private practice. Up to 1899 the duties of the different sanitary officers were laid down by the Local Government Board in the most indefinite terms, whose vagueness contrasted strongly with those laid down by the English Local Government Board under the 1875 Act, which could have been as easily taken as a model in 1878 as in 1899. But the duties as now defined equally required to be remodelled, and the relationship of the different officers carefully set out. Ireland was at least twenty-five years behind the sister countries in sanitary progress, and this he believed was entirely due to the defective administration of the Public Health Acts. Whether the dispensary doctors were retained or not, and he was one of those who thought they could be made most useful sanitary officers, especially as part of a State Poor-Law Medical Service, he was fully satisfied that no real progress would ever be made until county medical officers of health were established under the control of the County Councils. He would most strongly urge on this Conference to adopt the resolution outlined by the chairman in opening the discussion.

DR. J. KEAN (Newry) took exception to the remarks uttered by Dr. Magennis in reference to the Irish workhouse hospitals, as he felt that they were too sweeping, and he would be sorry to think their friends from across the water

would go home with the idea that Ireland was in a very bad sanitary way. In Newry, where he came from, they had a most up-to-date infirmary attached to the workhouse, and he was sure it would compare favourably with any infirmary in the city, both from a sanitary point of view and as regards equipment. He thought the picture painted by Dr. Magennis was very much exaggerated; and, besides, he could not understand how any medical officer would allow such a state of things to exist. He was very glad the question of county medical sanitary officers and sub-sanitary officers had been so fully discussed, and he hoped that the meeting would agree to a strong resoluion, and that it would be brought under the notice of the proper authorities.

Surgeon-Colonel Flinn (Dublin) spoke of the administration of the Public Health Acts in Ireland, and referred to the paper he had read in 1883 before The Royal Sanitary Institute on the subject. He stated that, although the improvement in the sanitary administration of the rural districts was slow, still progress had been made. It was but right to say that rural district councils endeavoured to carry out, though somewhat tardily, the suggestions made to them for bettering and improving the sanitary condition of their district, yet there was still room for considerable improvement.

Mr. Robert E. Matheson (Registrar-General for Ireland) cordially supported the proposal to appoint county medical officers. The Vice-regal Commission deserved credit for going to the root of the business, and reporting that not merely amelioration was wanted, but that the whole poor-law system was defective. He looked upon workhouses as affording refuges for idlers, and encouragement to immorality. Tuberculosis should be included as a notifiable disease, for until that was done they would not be able to grapple with the difficulty. He looked for great results from the work of the Women's National Health Society of Ireland.

Professor Antony Roche (Dublin) said he wished to point out that the dispensary medical officers were *ex-officio* medical officers of health of their districts, that in the majority of cases these officers obtained their qualification from the conjointed colleges in Dublin, that these colleges did not require their candidates to attend any course of lectures on sanitary science, and that consequently these medical officers were not sufficiently educated in their special duties, from no defect in themselves but from the curriculum of the colleges.

Mr. Lindsay and Dr. S. G. Moore also took part in the discussion.

The following resolution was passed:—*

> That this Conference is of opinion that it would be desirable to have County Medical Officers of Health, with a sufficient staff of qualified Sanitary Inspectors appointed for Ireland, and that the Council of The Royal Sanitary Institute be requested to take steps to urge this opinion upon the consideration of the Government.

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* Resolutions passed are referred to the Council, and their decision is given on page 311, No. 7.

THE ROLE OF SANATORIA AS A FACTOR IN CHECKING TUBERCULOSIS.

By PROF. E. J. McWEENEY, M.A., M.D., D.P.H., F.R.C.P.I.

Bacteriologist to the Local Government Board for Ireland.

(FELLOW.)

ABSTRACT.

THE sanatorium plays the most important part in the campaign against tuberculosis, because—

1. It is the only *curative* institution.

2. Without a place whither curable cases can be sent, the work done against tuberculosis can be at best only advisory, and therefore ineffective.

3. It provides the best centre on which popular endeavour may be focussed, and from which hopeful and hygienic streams of influence can radiate on to the community at large.

4. It may be provided out of local taxation under the existing law.

The speaker expressly disclaims the position that the struggle against consumption has for its only weapon the sanatorium. On the contrary, he holds that the following measures are also called for :—

(*a*) Compulsory notification under a special Act of Parliament so as not to impose upon consumptives the penalties entailed by the existing notification law.

(*b*) The provision of bacteriological aid in the diagnosis of early cases before the physical signs have developed. This means that the physician who attends the poor shall, in a doubtful case, be enabled to send the sputum to the municipal bacteriologist for gratuitous examination as to the presence of bacilli; his report, when positive, to be taken as a notification of the case at the public health office.

(*c*) Consequent on (*a*), the *thorough* disinfection of rooms vacated by consumptives through removal or death. The movable articles to be dealt with, so far as possible, by superheated steam in the public disinfection apparatus, the immovable ones to be dealt with locally by formic aldehyde vapour and (or) lime-wash. *The bactericidal efficacy of the measures*

adopted not to be taken for granted, but to be tested from time to time by animal experiment.

(*d*) The establishment of special dispensaries in populous centres, with the object of—

α Giving counsel to those threatened, so as to enable them to avoid the disease;

β Paying domiciliary visits to poor consumptives, so as to—

i. See that the advice given at the dispensary is carried out;

ii. Give the family the means of doing so, when they are too poor to provide what is necessary (eggs, milk, meat, cod-liver oil, etc., spittoons, disinfectants);

iii. Remedy bad sanitary conditions, such as overcrowding, by giving the consumptive family (*a*) pecuniary assistance to procure a more roomy abode, and (*b*) legal advice in the matter of compelling the landlord to put the place in proper sanitary condition;

iv. Remove the children from all danger of infection.

γ Applying the best modern methods to the diagnosis of the tubercular affection, and sending persons already affected to the appropriate institution, the early cases to the sanatorium, and the advanced and highly infective ones to the special hospital.

(*e*) The provision of the special hospital just referred to. It should be called the Consumption Hospital, to rob it of its hopeless character and prevent confusion with the sanatorium. It should be made comfortable, so as to induce infective cases to stay there; but in case of resistance, there should be powers to bring and keep them *against their will.*

(*f*) The provision of spittoons wherever possible in places of public resort, and the formal prohibition of spitting in public, under penalties which should not be allowed to become and remain a dead letter.

(*g*) A thorough system of inspection of all milk-producing establishments within the administrative area, and the bacteriological control of milk coming in from without, with the object of detecting the sources whence milk containing the virus of tuberculosis is supplied to the public, and putting a stop to the practice, with suitable compensation when due to want of knowledge, and with the severest penalties when wilful neglect is proved.

(*h*) Appointment of expert medical men to visit primary schools and periodically examine the pupils, segregating declared cases, and marking off those threatened for attendance in a special open air school.

The speaker's view is that since the campaign against consumption must begin somewhere, the point at which to start is the provision of a working-class sanatorium in each populous centre.

Without such provision much of the good obtainable from measures (*a*), (*b*) and (*d*) (above) is done away with, for mere knowledge of the whereabouts of a disease is of little use unless a remedy be provided, and early diagnosis and good advice are of little use in the absence of means for adopting the methods indicated.

The role of the sanatorium is (1) Curative and (2) Educative.

As proof of (1), the speaker refers to figures already given by him in his recent report to the Local Government Board, and shows some lantern projections illustrating the work done by one great group of German working-class sanatoria—that of the Hanseatic towns. He also refers to the results obtained by Drs. Bardswell and Chapman at Mundesley and Clacton-on-Sea.

(2) The educative influence is exercised not only on the patient himself, but on his family and friends after his return home, teaching them to practise cleanliness in person and house, and the value of fresh air, sunlight, and good nutrition with avoidance of alcohol.

Conditions for the success of the sanatorium are—

1. The reception of *early* cases only. When tubercle bacilli have appeared in the sputum, the case has already passed out of its *earliest* stage and into that of lung destruction. Modern methods, such as X-rays, agglutination, and diagnostic injections with Koch's old tuberculin, should be resorted to in order to assure the diagnosis before the sputum becomes bacilliferous.

2. The conduct of the institution by a genuine expert, *i.e.*, a medical man who has previously devoted all his attention for several years to sanatorium work. Much of his success will depend on his power of individualising his cases, and this cannot be done without special study.

3. The situation should be suitable and the construction *specialised* with the view of (*a*) dust prevention and ready cleansing; (*b*) avoiding draughts whilst securing the maximum of fresh air; (*c*) providing arrangements for the frequent bathing of the patients, and the adoption of those hydro-therapeutic measures which are an essential portion of any serious attempt to cure the disease.

4. The patients must not be allowed to return to their unhealthy vocations and surroundings, but must be provided with suitable, light, out-of-door employment after their cure. The admirable system devised and worked by Dr. Chapman at Clacton-on-Sea, of having a market

garden attached to the sanatorium, wherein the inmates can gradually acclimatise themselves to work and gain a livelihood, was referred to with warm approbation.

He concludes by expressing satisfaction at the interest which is now being shown in the subject by so many of the Irish sanitary authorities, and which is prompting them to form themselves into joint hospital boards for the provision of sanatoria. He trusts that one result of the present discussion will be the still closer focussing of public attention on this matter, and consequent speedy action with the result of saving the lives of hundreds of poor consumptives, and maintaining for several years the wage-earning power of many others.

DR. H. HANDFORD, (Nottinghamshire C.C.) expressed himself in favour of the development of the plan of taking into sanatoria a large number of persons for short periods for educative purposes. Injury had been done to sanatoria by making too great claims as to their curative powers. Sanatorium treatment was the best means known at present for combating the disease. He gave returns for the Notts Sanatorium, from which it appeared that in the last four years, out of 359 patients, 174 had recovered and 98 were dead, and others were in different stages of recovery. The influences of the sanatorium had been clearly shown in the more general use of open windows both in private houses and in factories; and in the fact that, *since the establishment of the sanatorium*, wards in the general hospital, the workhouse infirmary, and the infectious hospitals had been devoted to the open-air treatment of consumption with much success.

PROFESSOR ANTONY ROCHE (Dublin), whilst agreeing with many of the observations of Prof. McWeeney, considered that more emphasis might have been put on the importance of improvement in the general sanitary conditions of the people in checking the spread of this disease. This improvement would have greater influence than the establishment of sanatoria. It must be remembered that the decrease in the death-rate from this disease in England took place before sanatoria were established, and was mainly due to improvement in the sanitary conditions, whilst in Ireland the neglect of these improvements had been followed by an increased death-rate. If the local sanitary authorities in Ireland were to bear the expense of the establishment and upkeep of sanatoria, he would rather see the money required for these purposes spent on improving the housing of the people and the other general sanitary reforms. It would be useless to establish sanatoria throughout the country and leave the present sanitary conditions as they are. It must be remembered that the value that may follow the establishment of sanatoria was not the same in every country. In those where already the general sanitary conditions were favourable, and where the people could

bear the expense of keeping up these institutions, the question presented quite a different aspect than in Ireland. Two propositions put forward by Prof. McWeeney he could not agree with, first, that the point at which to start the campaign against consumption was the provision of a working class sanatorium in each populous centre, he would rather say that the point to commence was the improvement of the housing and general sanitation of the people; and second, that sanatoria were the only curative institutions. He thought that the improved house and the instructed patient might in many cases take the place of these institutions. Sanatoria it was asserted were established for two objects, to cure cases in the earliest stage; and to spread the knowledge of the preventive measures by those that have been treated. Such education could easily be spread amongst the people by other means than the very expensive one of the establishment of these institutions. The justification of their establishment must rest upon the proof that they cured a sufficient proportion of cases to influence the spread of the disease, and that the expense so incurred could be employed in any other measures with better results. The question of cure of these cases in those in prosperous conditions of life, able to give the time and money without stint to effect this object, need not be specially considered, as the great majority of cases did not belong to this class. By far the greater number must be supported in these institutions at the public expense, and probably for years subsequently if the amendment or cure were to continue. Moreover, in many cases the public would be called upon to support in whole or part those who were dependent upon the patient for their support. He was afraid the public had formed an exaggerated idea of the number of cases that might be expected to be cured even when the cases were admitted in the earliest stage. The latest statistics he could obtain were from Germany, "Lancet," May 11th, 1907. There were at present in existence there 80 public sanatoria, with 7,500 beds for the working classes, 13 private sanatoria with 2,000 beds, 13 sanatoria for children with 500 beds. The proportion of recoveries to admission 34 per cent., 31 per cent. of the patients became permanently disabled after five years. Before sanatoria were heard of both clinical experience and post-mortem demonstration showed that many cases of tuberculosis were cured. Moreover, hospitals for the incurable cases should first be established, as these were the cases that chiefly spread the disease, and sanatoria for the earlier or so-called curable cases should only be dealt with when the incurable cases were provided for. Of course if the sanitary authorities had the means of dealing with both classes at the same time well and good. Again, he held that the large expenditure at present spent on sanatoria was unnecessary and in Ireland would be impossible, and he was opposed to large buildings and in favour of small separate cottages. Lastly, he failed to see how Ireland with its towns diminishing in population and wealth its country population in many cases barely able to exist, could be expected to bear the large expenditure required directly and indirectly to establish and keep up these institutions in numbers in any way likely to influence the spread of this

disease. The only way the question could be effectually dealt with was by the Government undertaking the responsibility. In conclusion—(1) He did not deny the value of sanatoria, but he though it had been exaggerated. (2) The establishment of sanatoria without improvement of the general sanitary conditions of the people would be useless; and where the funds available were limited, he would rather carry out the improvement first. (3) The establishment of sanatoria on a scale to influence the spread of the disease would involve the expenditure of very large sums of money, and the local authorities in Ireland certainly could not bear that expense. Therefore, if the system was to be adopted it must be made a Government undertaking. (4) That the establishment of hospitals for the incurable cases should precede the sanatoria when the funds available permitted only one establishment.

DR. W. G. WILLOUGHBY (Eastbourne) urged the advantage of using existing buildings wherever possible for the isolation of consumptives, and gave an account of Dr. Newsholme's very successful experiment in Brighton where some (formerly enteric fever) blocks of the infectious diseases hospital were utilized for consumptives. Education was a more certain result of these institutions than cure, and in his opinion, while cures were doubtful education was certain. The erection of costly sanatoria was more harmful than useful; such palatial buildings and grounds not only were not necessary, but the expense frightened local authorities. The ordinary poor law institutions were doing great work in the prevention of consumption, because they received the very poor and advanced cases from crowded homes, and in each such building there should be separate isolation for consumptives who should not necessarily be made paupers. Sanitary authorities should aim at making every man's home a sanatorium, but in the meantime we should have in Dr. Willoughby's opinion to depend largely on the poor law for advanced cases, and on such sanatoria as the one at Brighton for commencing cases.

MR. EDWIN T. HALL, V.-P.R.I.B.A. (London) spoke against the German system of the rest cure. At the Frimley Sanatorium which he had designed, the patients, under the able direction of Dr. Paterson, worked regularly their work was increased as they grew stronger, and they became eventually as strong as ordinary people. Not only so, but men who went back to factories insisted upon windows being open at their work. These were schools of health as well as sanatoria. He had recently been devoting a great deal of attention to the problem of cheap sanatoria for the million, and he had evolved and recently published a design which he believed could be built at from £85 to £100 per patient.

MRS. RUSHTON (Dublin) detailed he objects of the Women's National Health Association. They were not for Dublin alone. From all over the country they had had correspondence, and they had sufficient names and subscriptions to form the nucleus of a most useful work. She noticed that the

general councils of county councils had sent a memorandum to the Local Government Board, and one of the remedies advocated was the establishment of parish communities to give advice and distribute literature on the subject of preventive and simple home methods against consumption. That was the idea of the Women's Health Association. Lady Maurice Fitzgerald was about to start a branch in Wexford.

DR. A. GLEN PARK (Bolton) briefly sketched what Bolton, a busy manufacturing town, had done in the matter of meeting Dr. McWeeney's requirements. They had had for several years compulsory notification of phthisis, granted by Parliament on much the same terms as Sheffield had. It worked satisfactorily, and no complaints were received regarding it from patients or medical practitioners. The home was visited by the inspector, and surroundings, etc., examined. Instructions were given regarding ventilation and care with regard to sputum, and disinfection of the house was carried out. Regarding the bacteriological examination of the sputum of suspected cases, the medical attendant was encouraged by getting any case examined free of cost, an arrangement being entered into by the Corporation with the Manchester University Public Health Laboratory, under Prof. Delépine. In the matter of treatment, Bolton Corporation had four beds at Meathop in Cumberland and the Bolton Guardians two beds. This arrangement had only been in existence for twelve months, so nothing much could be said regarding the treatment for some time. The Waterworks Company, however, had put at the disposal of the Sanitary Committee a large residence with plenty of ground attached, on their watershed area, for use as a sanatorium, if they thought it was suitable. It was now under the consideration of the committee. He had urged on the Bolton Corporation the advisability of protecting the sources of their milk supply, which came mostly from the immediate neighbourhood, by the appointment of a veterinary surgeon as chief meat inspector, who was also a diplomate in public health as applied to veterinary medicine. In this way proper inspection of the cows and cowsheds could be carried out, the existing by-laws regarding cleanliness of animals and attendants on the animals put into force instead of being *practically* of no use, tuberculosis udders detected, and any other disease likely to be the cause of disease in the consumers of the milk.

MR. R. LAMBIE also took part in the discussion.

DR. MCVITTIE (Dublin), at a subsequent meeting, said that the group of conditions now recognised under the term "pretuberculous" was deserving of more attention than it had hitherto received in these countries, and that The Royal Sanitary Institute should request the attention of medical officers of health and of sanitary authorities to the question. He was aware that some people would object to the term "pretuberculous," as they claimed that an individual

was either tuberculous or not tuberculous. Professor McWeeney, in his very able paper, had suggested the word "prebacillary," which was no doubt better, but as "pretuberculous" had been used for some years in the current literature of the subject, they might perhaps retain it for the present. Every medical man who had had some years' experience could point to cases in which early recognition of the predisposition, and a prompt adoption of suitable measures, had resulted in vigorous and useful lives; he would, unfortunately, have seen only too many instances in which supposed cures had resulted, after a few lingering years, in untimely deaths, too often to be only re-enacted by the early dissolution of a feeble offspring. The only effort in this direction that had yet been made in these countries, so far as he was aware, was an institution which had been established in Margate, where cases of that kind were received for a few weeks or months, and from which they returned to their original unhealthy surroundings, with the almost inevitable result that there was only a temporary postponement of the full development of the disease. In France such cases were sent to a country colony, where they were retained for some years, and every effort was made to train them to become farm-hands, or gardeners, or foresters; in fact, to follow some healthy outdoor occupation where early hours, open air, and good, plain food might permanently establish their opwers of resistance, and enable them to become useful members of the community. It should be borne in mind that market gardening, while quite permissible for the pretuberculous, should not on any account be entrusted to the tuberculous, as vegetables and fruit (such as lettuce, celery, tomatoes, and strawberries, which are often eaten raw) may become a medium of distributing disease broadcast.

The following resolution was passed:—*

> That the group of conditions now recognised under the term "Pretuberculous" is deserving of more attention than it has hitherto received in these countries, and that this Conference recommends the Council of The Royal Sanitary Institute to direct the attention of Medical Officers of Health and Sanitary Authorities to the question.

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* Resolutions passed are referred to the Council, and their decision is given on page 311, No. 7.

CONFERENCE AT DUBLIN.

Section II.—ENGINEERING AND ARCHITECTURE.

THE ECONOMIC HOUSING OF THE WORKING CLASSES IN TOWN AND COUNTRY.

By P. C. COWAN, B.Sc., M.Inst.C.E.
(FELLOW.)

AT the outset I desire to express my sincere appreciation of the honour done me in calling upon me to act as President of the Section of Engineering and Architecture, and my hope that all who have gathered to this conference in the ancient and beautiful capital of Ireland, will gain pleasure and profit in bountiful measure.

Many, in approaching Dublin, travelled from Kingstown on one of the earliest railways in the British Islands, and it is interesting to remember that the first electric railway in Great Britain was that from Portrush to the Giant's Causeway, and that it owes its existence largely to the energy and enterprise of Dr. Traill, Provost of Trinity College. The only railway on the Lartigue or Mono-rail system in these islands is to be found in the West of Ireland, between Listowel and Ballybunion, and the latest ideas regarding mono-railways have sprung from the fertile brain of Mr. Brennan, a native of Connaught.

Dublin is full of interest to the architect and antiquarian, and I regret to think no time has been set apart for a disquisition on the beauties of old Dublin by Sir Thomas Drew, who is a devout student and an eloquent expositor of them.

I should greatly desire to touch upon many points of interest to members of the Institute, with the view of indicating the progress made in matters affecting the public health and public convenience in recent years, but the brief time at my disposal may, I think, be most usefully spent in directing attention to what has been done in Ireland in connection

with the great question of the housing of the working classes, which has engaged so much attention in these Islands since the first Acts bearing on the subject were pressed through Parliament in 1851 by the late Earl of Shaftesbury, whose successor now most worthily fills the high office of Lord Mayor of Belfast.

In this country, as in England, the younger members of the rural community, whose views of the possibilities of life have been widened by an education of a kind which was beyond the reach of their fathers, are not content to live on in their native environment, and flock in an increasing proportion to join the life of more varied interests to be found in towns, where, though they as a rule do well on account of their superior physique and vigour, they cause a congestion in the labour market, and crowd out the feebler folk who constitute the unemployed and unemployable in the city. It has now been long recognised that organized efforts should be made to ameliorate the lot of labourers in the rural districts, and to help the working classes in our towns to live a healthy life. But it is in only comparatively recent years that the "*laissez faire*" policy has been frankly abandoned in connection with this question, and there are many who are still of opinion that, unless satisfactory balance sheets on a commercial basis can be produced with regard to such schemes, they should not be undertaken.

Public opinion now, however, generally agrees with Goldsmith that

"Ill fares the land, to hastening ills a prey,
Where wealth accumulates and men decay,"

and while we have not yet re-enacted the statute of the 31st year of Elizabeth, which provided that no cottage should be erected without having four acres of land attached to it, the attention of Parliament has been steadily directed in recent years towards measures calculated to improve the dwellings of the people.

The waste of capital and revenue involved in the conditions of life in slums or insanitary hovels is now being generally recognised, and the perils to all classes of the community caused thereby have become manifest. We cannot afford to allow such conditions to exist, and it is the truest economy to remove them.

Professor Koch says:—

> "It is the overcrowded dwellings of the poor that we have to regard as the real breeding-places of tuberculosis; it is out of them that the disease always crops up anew, and it is to the abolition of those conditions that we must first and foremost direct our attention if we wish to attack the evil at its root and wage war against it with effective weapons."

In 1895 Dr. Bowmaker attributed the want of success in the applica-

tion of the Housing of the Working Classes Acts to apathy on the part of local authorities, who, he stated, were unwilling to take action to remedy unsatisfactory conditions, or even to prevent the growth of such conditions. Alderman Thompson, in his invaluable handbook on housing, explains this apathy to some extent by stating that the local authorities dare not carry out the Public Health Acts for fear of inflicting worse evils upon the people than they endure at present.

In 1900 the Local Government Board pointed out that local authorities should have a house-to-house inspection in their districts to ascertain what nuisances call for abatement and what houses are unfit for human habitation, but I am not aware of any really effective action in this respect outside a few of the larger English cities. There is no doubt that the primary need in the case is efficient inspection.

In the report of the Select Committee on the Housing of the Working Classes Acts Amendment Bill, lately issued, it is stated:—

> "The house famine in town and country which often exists in regard to the working classes is incontestable. The many investigations, Royal Commissions on Housing and Labour, etc., Select Committees of the House of Commons, and official departmental reports have placed the fact beyond controversy," *and also* "that however cheaply cottages may be built, they cannot be erected in the ordinary rural districts . . . . . so as to cover interest and sinking fund, and the usual annual outgoings within the rent-paying capacity of the labourer."

There is a special reason why a liberal policy is necessary in Acts affecting agricultural labourers in Ireland, as the reports of Mr. Wilson Fox, Labour Commissioner of the Board of Trade, show that the average rate of earnings per week (including all allowances in kind) of agricultural labourers in Ireland in 1898 was less than two-thirds of the average rate in Great Britain, and ranged from 8s. 7d. in Co. Mayo to 12s. 6d. in the counties of Antrim, Down, and Dublin.

In July, 1906, before the Select Committee on the Housing of the Working Classes Bill, Mr. Wilson Fox gave evidence that rural housing cannot at the present time be developed upon an economic basis without some form of subsidy or cheap loan, and that even with a 60 year period for a loan at 2 per cent., a cottage costing £150 should be let at 2s. 6d. a week to cover the loan charges, rates, taxes, water supply, repairs, insurance, and collection.

The first Labourers (Ireland) Act was passed in 1883, and at 31st March, 1906, 20,634 cottages had been built, and 887 were in course of erection. For these cottages loans amounting to £3,415,280 were sanctioned, equal to about £159 per cottage with plot. These loans are

repayable by an annuity, covering interest and sinking fund, of £4 17s. 2d. per cent., with a period of 50 years.

By the Labourers (Ireland) Act, 1906, a great improvement in the financial facilities for building cottages was effected, and the District Councils may now obtain loans not exceeding, in all, £4,250,000, repayable by an inclusive annuity of 3¼ per cent., and the Government has undertaken to pay 36 per cent. of the loan charges, so that only 64 per cent. of £3 5s., or slightly less than $2\frac{1}{12}$ per cent. will be payable by the District Councils for interest and repayment of the loans, for which the period is 68½ years. During the passage of the Bill of 1906, it was stated that the cost of a cottage and plot should not exceed £170. On this assumption the 4¼ millions made available should provide for the erection of 25,000 cottages with plots.

With a rent of 1s. 3d. a week for a cottage and plot costing £170, a deficit of £5 0s. 2d. on loan charges alone was inevitable until the Act of 1906 was passed, but, under the term of that Act, a similar deficit of only 5s. 9d. per cottage will fall upon the local rates. Of course in each case the cost of maintenance, insurance, collection, etc., has, in addition, to be met by the local authority. Mr. Wilson Fox puts these charges, along with water supply, at £2 5s. a year, which is probably too high for Ireland.

Between 1883 and 1906 an annual Government grant of £36,811 was distributed in Ireland, to be applied towards the cost of providing cottages under the Labourers Acts. The allocation was made in proportion to the expenditure on roads and bridges in the various counties, and as such expenditure bore no relation to the urgency of the housing question, or the expenditure incurred in connection therewith, the amount available from this grant for relief of the local rates in respect of each cottage provided, varied from 11s. in Co. Meath, where 1,589 cottages had been provided by 1st Nov., 1906, to £18 in Co. Armagh, where the cottages provided only numbered 59.

Under the Act of 1906 this annual grant is reduced to £30,811, and will now be distributed according to the number of cottages actually provided prior to 1st Nov., 1906. It will relieve the local rates to the extent of £1 8s. 8d. for each cottage provided before the loans were obtainable on the very special terms of the new Act.

Up to 1906 only about 2 per cent. of the total number of cottages was erected in Connaught, and less than 10 per cent. in Ulster. In the latter province a number of cottages with weaving rooms attached have been erected for hand-loom weavers of linen.

The rents now charged throughout the country for a cottage and plot

of at least half an acre, provided under the Labourers (Ireland) Acts, vary from 6½d. to 2s. 6d. a week, the general average being 11d. a week, but in Mr. M. O'Sullivan's excellent book on these Acts, 1s. 3d. a week is indicated as an average rent which might fairly be expected. It was apparently never expected that the rents would meet the annual charges fully, and the original Act provides that the District Council may levy a rate not exceeding 1s. in the £ for the purposes of the Act, and this limit was closely approached in recent years in parts of the counties of Cork, Limerick, and Waterford.

In the report of the Select Commission already referred to, the opinion is expressed that the difficulty as to rent would be largely diminished by the addition of land to the cottage, and one witness who has given great attention to the study of rural conditions in England (Mr. Rider Haggard) said, "The real solution of all this cottage question is small holdings: give the men some land—a small holding—and they will soon find their own houses."

Opinions I think widely differ on this point; much evidently depends on the quality of the land and its proximity to good markets. Small holdings are very plentiful in Ireland and the results are not altogether satisfactory. So far as I can learn, the wisest view as to the Labourers (Ireland) Acts is that the most pressing part of the work to be done is to supply sanitary houses of moderate dimensions and cost with a reasonable garden plot, and that there is a danger, if great economy is not exercised, that, even with the facilities of the Act of 1906, the task will become impossible on account of the great disparity between outlay and revenue, and the large number of cases to be dealt with.

Until the present year designs for cottages under the Labourers (Ireland) Acts were prepared by architects for the local authorities, in accordance with simple general requirements framed by the Local Government Board; but, in accordance with a somewhat general desire, the Board has now issued a set of eight plans for houses with three or four rooms, and a general form of specification which contains a number of alternative clauses to suit varying local conditions.

Four of the plans were obtained by means of an open competition, the terms of which called for a kitchen and three bedrooms, an open shed, and simple pail closet, a height of ceilings on the ground floor of eight feet, and a minimum net cubic capacity in the rooms of 3,300 cubic feet, at a cost not exceeding £130. All the prize plans are for one-storied houses, and the particulars as to gross and net cubic contents are as undernoted:—

	1st Prize design.	2nd Prize design.	3rd Prize design.
	Cubic ft.	Cubic ft.	Cubic ft.
Cubic contents of building (excluding out-offices), taking outside dimensions on plan and height from mid-level of foundations to mid-level between eaves and ridge	7,500	6,255	7,223
Net cubic contents of each room—			
Living room	1,500	1,203	1,305
Bedroom A	975	614	938
" B	975	918	650
" C	900	612	650
Total	4,350	3,347	3,543

About 400 sets of plans were submitted in the competition, and many of the designs were of considerable merit. Those selected have been very freely criticised, and some interesting letters and original designs have recently appeared in the Dublin newspapers. It will, I think, be readily conceded that any such plans would be open to adverse criticism. Some critics urged extreme provisions as to ventilation, and others laid stress on the value of cosy corners. Nearly all the criticisms and suggestions were, however, of some value, and it is to be hoped they will aid in the solution of the difficult problem, how to secure a satisfactory labourer's cottage at a cost which bears a reasonable relation to the rent obtainable and to the available financial resources.

Two enterprising firms of contractors have erected, for the Home Industries Committee, at the Irish International Exhibition, cottages on the designs which obtained the first and second prizes in the competition, but it is probably only fair to them to state that the time afforded for erection was very limited, and also that the roof of the second prize cottage as erected is higher than, and not quite so picturesque as, the roof shown on the premiated plan. I understand that these firms are prepared to erect cottages according to the prize designs, with or without slight modifications, for a price closely approximating to the sum of £130 already referred to; but of course, to secure a low cost, they would probably require to have a contract for a considerable number of houses.

In Co. Cork contracts have already been taken for the erection of a number of cottages, according to the third prize design, at less than £130 for each cottage.

In Ireland, as might be expected, the operations of the sanitary authorities, as to building houses under the Housing of the Working Classes Acts, have not been very extensive, though the attention of the various councils has been carefully directed to the purpose.

The Act of 1903, which gave added borrowing powers for this purpose, does not extend to Ireland, and, except in the case of the county boroughs and a few urban districts which obtained local Acts, the main difficulty has been one of borrowing powers. No government grants or special terms for loans are obtainable under the Housing of the Working Classes Acts; and at present 4 per cent. is the rate charged for interest only on government loans for a period of 40 years.

Up to March, 1906, the local authorities in Ireland under these Acts provided accommodation for 4279 families, at a cost of about £180 per family, or £789,874 in all. The average rent is about 2s. 4d. a week, and the average annual loss about £3 5s. per annum. In the Dublin district, including the townships, most interesting examples of municipal effort in this direction can be seen; and the magnificent rehousing schemes of Lord Iveagh are worthy of special attention, as are also the varied and able designs of the City Architect. In the Dublin district the Dublin Artisans' Dwelling Co. has provided 3,500 excellent dwellings, at a cost of about £600,000; and if to these are added the dwellings provided by the Iveagh and Guinness Trusts, the Suburban Artisans' Dwelling Company, and the Association for the Housing of the Very Poor, a total of 4,665 dwellings, costing about £750,164, is reached. It is interesting to observe that these associations have provided more houses in the Dublin district than have been provided by other town authorities in the whole of Ireland.

I would here draw attention to a few points in the recommendations of the Select Committee on the Housing of the Working Classes Acts Amendment Bill, which appear to be of very special interest. It should be noted that in England and Scotland these Acts apply to rural as well as to urban districts. This Committee recommends:

(1) That the administration of the Public Health and Housing of the Working Classes Acts should be transferred from the Rural District Councils to the County Councils.

(2) That a great improvement in sanitary inspection should be provided for, and requires the appointment of a staff of county sanitary inspectors, who should be properly qualified whole-time officers and act under a County Medical Officer of Health, who should also devote his whole time to his public duties.

(3) That a register of survey of all buildings intended for human habitation should be compiled, and revised periodically.

(4) That the County Councils should make by-laws for every district.

(5) That the Local Government Board should appoint a special Housing and Public Health Department, with a staff of travelling sanitary and housing inspectors to supervise the administration of the Public Health and Housing Laws by the County Councils and their executive officers.

(6) That the Treasury should lend money for the purposes specified in the Report, at the lowest rate at which the Treasury can borrow—

 (*a*) To local authorities, up to the full amount of the security;

 (*b*) To public erecting societies, up to 75 per cent. of the security.

(7) A simplification and codification of the Laws under the Public Health and Housing Acts.

The Select Committee expresses surprise that the Housing of the Working Classes Acts have not been applied to a greater extent for the adaptation of old buildings, but experience in Ireland has shown that as to rural districts such adaptation is usually less economical than new building.

The great influence of a good caretaker on the condition of working class dwellings, and on the cost for maintenance, is not sufficiently regarded, and I am convinced that a city may possess an abundant supply of cheap houses in fair condition, and yet be in great part insanitary on account of the domestic habits of the people. An improvement in these habits is urgently required, and can only be secured by education in simple hygiene and a much more rigorous inspection of the sanitary condition of houses than is now provided for. The Swiss method, of collecting along with the rent a fixed sum for repairs, and returning to the tenants, at the end of the year, any portion of such sums not actually expended, has much to recommend it, as it tends to secure "the stitch in time." Local authorities in Great Britain and Ireland require additional powers to regulate the laying out of streets and buildings on the outskirts of the towns, to prevent them from being encircled with mean streets.

As to the provision of new houses for the working classes in towns, the operations of voluntary societies or companies should probably be looked to as the most hopeful factor, and it is most desirable that such operations should be aided as far as possible by the State.

SIR LAMBERT H. ORMSBY (Dublin) said that it was the bounden duty of them all, whether doctors, architects, or public sanitarians, to see what they could do for the poorer classes, and to endeavour to provide them with comfortable and sanitary homes. In Dublin a great deal had been done in that direction. The improved change which had taken place in Dublin slums and in the improved sanitary arrangements of the city was mainly due to Sir Charles Cameron. The Corporation had supplied a great many dwellings for the poor, but unfortunately they did not seem to be able to make them pay, only one block of the whole number being made to pay. The Bride Alley site cost the Corporation £33,000 before they put a single brick on it. For the same area he was able as a private individual to get a site for the Association of the Very Poor (of which he was chairman) at £2,020. That showed that private individuals could make better bargains than Corporations. The Iveagh and Guinness Trust was the next great housing scheme. They provided a great many dwellings, but they, like the Artisans' Dwellings Company, catered for a more respectable class of people who were better able to pay the rents demanded by the trustees. There were next several private tenement companies. Trinity College had a building company, and they were doing a good work; and the Alexandra Ladies' College had also a similar company. Sir Charles Cameron thought, however, that the *very poor* still required accommodation, and he induced some of his friends to start a company in the year 1898. The company, named The Housing of the Very Poor Association, was started, but at first only £5,000 of the £20,000 capital was subscribed. They bought four houses in Werburgh Street at a cost of £1,500, and it cost a further £1,500 to put the houses in a proper sanitary condition. That scheme paid a great deal better than the scheme in Summer Street, where they built a large block of new houses, and where they gave one room with a recess for a bed, a wire mattress, and all sanitary appliances self-contained. The people in the latter place greatly appreciated the arrangements. There was a reading-room in the building, to which all the Dublin newspapers sent copies of their journals free; and recreation was provided for the children of the tenants occupying this new block in a spacious playground surrounding the houses.

DR. SPOTTISWOODE CAMERON (Leeds) said that different towns had different tendencies, and what was required for one was not always suitable for another. In London there was a great dearth of working-men's houses, and, though there was a great tendency to increase in the suburbs, as a considerable portion of the population required to live near their work, and land near the centre of the town was expensive, the housing difficulty was great. In Liverpool, work of the casual kind more or less required that the labourer should be housed near the docks. The work demand was sudden and irregular. Liverpool was a standing example of what a municipality could do to rehouse its slum population. In Leeds, on the other hand, while a certain amount of casual labour was required in the neighbourhood of the markets, the work generally was more distributed

over the town, and there was not the same need as in Liverpool for concentration in the centre. In Leeds, in fact, the tendency had been of late years for workpeople to get out of the town, and the new houses in the outer districts were often well occupied when the old houses in the centre were devoid of tenants. So many of the houses in the centre of the town were empty, that there was no great demand, at present, outside the stereotyped parliamentary requirements, for the rebuilding of workmen's dwellings in the slum districts. It was, moreover, absolutely necessary in all those towns that the slum property should be destroyed, or so altered as to make it reasonably healthy. The provision of electric trams, connecting workplaces with the outer districts, was a great rehousing movement in the right direction. The provision of electric power, so that factories could be set up in suburban areas, and not crowded into the riverine districts of the town on account of water for condensing purposes, or the necessity of being near coal wharves, was also a factor of decentralisation. Experiments of that form of decentralisation were made, for instance, at Saltaire by the late Sir Titus Salt, who constructed a model village, and more recently at Bourneville and Port Sunlight, where individual industries had been started and populations gathered round the factories. All those, however, were single industries. It was more to be desired that the garden city idea of mixing up houses and workplaces under proper sanitary regulations should be extended. By going further out, land was cheaper; by having complemental industries, the disadvantages of bad times were lessened; whilst the bringing up of children in clean, fresh air, instead of in the contaminated air of slums, promised hope for the future. Even where the industries were not carried on outside, it was desirable that the industrial population should live in the less crowded neighbourhoods, and that even if the adult population had themselves to work in the less favourable surroundings, the schools and playgrounds which their children frequent should be in the healthier atmosphere of the suburb.

Mr. Ralph Dagg (Baltinglass) said that Mr. Cowan had treated the subject largely from a statistical point of view, and he wished to deal with it from an economic aspect. Public opinion was under a profound misapprehension with regard to the operation of those laws for the better housing of the labouring classes in Ireland, and which were entitled "The Labourers (Ireland) Acts." This was not surprising when they found a writer like Dr. Joyce, in his "Outlines of the History of Ireland," in treating of those statutes, making (*see page* 308) the following statement: "These cottages and garden plots are given to the labourers of the place, at very low rents, barely sufficient to pay off in time the expense of erecting the buildings. So, while the counties *are at no loss*, the labourers are great gainers." *That* statement was a fallacy and should be corrected, as it was likely to embarrass future students of economic history. The plight of the Irish agricultural labourer as to housing was long a matter of

public notoriety. Their cabins were an eyesore, which afforded a persistent subject for the pencil of the caricaturist; though underlying the grotesque delineation of Paddy, his pig, and his shieling, lay unsolved an important social problem. However, the wheels of progress were greatly accelerated in the Victorian age, which was marked by the initiation of legislation dealing with public health, and for the prevention of the unhealthful conditions of factory workers. The existing state of things was due to various causes, amongst which might be named the comparatively small size of Irish farms, namely 20 acres; the insecurity of tenure of the tenant farmers heretofore; and the blight of absenteeism. The intolerable position was attempted to be remedied through the instrumentality of the Public Health Acts, which imposed penalties on immediate lessors who neglected to maintain their houses in a condition conducive to health. Those conditions were often more honoured in the breach than in the observance. A further step was taken when fair rents, free sale, and fixity of tenure were conceded, and the Land Act of 1881 accordingly provided that the Land Commission, when fixing a fair rent, could make a mandatory order on the tenant farmer to build on his holding a suitable cottage for a labourer. This provision was based, no doubt, on the principle that the occupation of land had its duties as well as its rights and privileges. The great defect in the Act was that it afforded *no cheap facilities* to the tenant farmer for obtaining money to build the cottage, and the cost of the loan obtainable was excessive. The manner of having the order enforced, by a prosecution to be instituted by the local sanitary authority on receipt of a petition from ratepayers, *who might be themselves in default*, was naturally absurd. Hence the provisions of this Act never were put in force. Lastly, the State itself stepped in and, rightly or wrongly, imposed the duty of properly housing the agricultural labourers upon local sanitary authorities by the Act of 1883. Such authorities were empowered to raise loans for the purpose of building labourers' cottages. At that time there were in Ireland (according to the census returns of 1881) 40,665 hovels described in the following terms: "The fourth class comprised all mud cabins, or houses built of other perishable material, having only *one* room and window." These one-roomed wigwams were occupied by no less than 90,292 families, or, in other words, by more than two families to each. The "third class" of dwelling was more pretentious. They consisted of a better description of house, with two to four rooms and windows. This class numbered 384,475. Several statutes amending that Act had since been passed, culminating in the Act of 1906, which came into operation on the 1st of February, 1907. Mr. Cowan had given a lucid synopsis of the transactions under the Acts, and from his statement it was easy to estimate the aggregate yearly losses that had arisen, or would arise, under their operation. The loss, he stated, per cottage under the old Acts, giving credit for a rent of 1s. 3d. per week, amounted to £5 per year for loan charges *alone*, not including the incidental outgoings. These latter Mr. Wilson Fox had estimated at £2 5s. per year. The loss per cottage under

the new Act in respect of loans was estimated at 5s. 9d. per year. Hence, the entire rents would be absorbed by the outgoings. Reducing the cost of maintenance by 33 per cent. (*i.e.*, to £1 10s. per cottage per year), the total losses would be as follows:—

	£	s.	d.		£	s.	d.
Under the old Acts, loan charges alone .	5	0	0				
Plus, cost of maintenance, etc.	1	10	0				
21,521 cottages @	6	10	0	=	139,400	0	0
Under the new Act, loss on loans......	0	5	9				
Plus cost of maintenance, etc.	1	10	0				
25,000 cottages @	1	15	9	=	43,800	0	0
Total loss on local rates					183,200	0	0
Add to this grants in aid, Old Acts					31,000	0	0
,, ,, New Act					52,600	0	0
Gross Loss					£276,800	0	0

This money could be better applied in affording adequate relief to the aged and worn-out workers than in subsidising the able-bodied. Two parliamentary returns relating to the working of the Acts (Nos. 193 and 194) were issued in the session of 1906. The public circulation of these returns would afford astonishing information. Return No. 193 discloses that the legal expenses varied from £1 per cottage in Wexford up to £75 per cottage in Monaghan. Just reflect on it: £75 per cottage! probably the threefold value of the fee simple of the plot. There were other cases on a par with this if the full facts were revealed. For instance, the law costs for 13 cottages in one district was given at £113. These cottages were built on one plot containing about 1½ acres on which stood 13 condemned cabins. This property was owned by a head landlord, a lessee, and a sub-lessee, and the costs of the conveyance of this acre and a half were £113! Such costs were being piled on for years, and they appear not to have concerned the powers that be as much as the luncheons partaken of by the governors of a lunatic asylum. In future the provisions of the Labourers (Ireland) Order, 1906, would frustrate the inflation of law costs in cases of compulsory purchase, if not in agreement cases. The return gave the number of cottages "applied for" in the last completed scheme as 10,058, of which only 4,748 were passed. This was extraordinary in view of the fact that upwards of 40,000 more cottages had been applied for under the Act of last session. But it was more striking to note that it had taken numerous schemes year after year since 1883 (*i.e.*, 24 years) to pass and build 21,000 labourers' cottages; and it would probably take as long a time to carry through the 25,000 cottages which it had been estimated could be provided under the provisions of the new Act. For one thing, there were not sufficient masons to build them in a few years. Now many of the two to four-roomed dwellings included in the third class were as insanitary as those of one room. A demand would therefore inevitably arise for an extension of the system of State housing in the interests

of these sections of the community. That demand could not logically be resisted, and its concession must lead to further financial embarrassment. The losses referred to fall directly or indirectly upon the ratepaying community, and it was desirable to consider whether that incidence operates justly or not. To enable one to arrive at a right conclusion it was necessary to put before our minds the economy of the Irish agricultural system. There was in Ireland a comparatively small number of large farmers or occupying owners, a substantial number of larger farmers, and a *very* large number of small farmers. The particulars were given in the census returns for 1901 as follows:—

Class I.—Number of agricultural holdings valued over £100 a year	15,271
„ II.—Ditto, valued from £30 to £100 a year	61,495
„ III.—Ditto, valued *under* £30	413,585

The third class, it must be noted, did not want the services of any labourer, for they were really labourers themselves, performing with the assistance of their families all their own work. They obviously held in the aggregate a considerable portion of the rateable landed property. The second class consisted of persons who wanted and employed labourers, but who as a body had *not* fulfilled the liability attaching to the occupation of land, and had not provided proper housing accommodation for the labourers they employed. The first class also wanted and employed labourers, and this class in the main had provided their labourers with suitable houses. The effect therefore of the working of the Labourers' Cottages Acts was that yeomen farmers and occupying owners who had done their duty towards the agricultural labourers, and the great number of small farmers who did not want hired labourers, were called upon to pay for the housing of the labourers employed by those larger farmers comprised in the second class, who had neglected to fulfil the obligation legally and morally incumbent on them. A further result of the working of the Acts, which must have serious consequences, was that private enterprise would be completely extinguished, "John Bull," it had been well said, "can stand most things, *but not* 2 per cent." The rents received for labourers' cottages represented a return of 1¼ per cent. on the outlay, which allowing ¾ per cent. for the sinking fund left a balance of ½ per cent. for interest. Individual enterprise could not compete with this, ½ per cent. sounds its death knell. No wonder the owners of tenement houses closed them up rather than waste money in their repair when notified to do so by sanitary authorities. Again, an impossible position was created. The State supplied one citizen with a cottage and allotment for a rent of 1s. per week; his next door neighbour for a cottage *alone* had to pay a rent of 1s. 6d. per week, which might be only reasonable "profit-interest" on the capital outlay. This state of things was bound to give birth (and had already done so) to heartburnings and discontent, so it could not continue unredressed. It must also militate adversely to collectivist principles that money loaned by the public for State purposes at such a very low rate of interest, with a sinking fund approaching the vanishing point, could not be utilised without enormous loss. The Act of 1906 (Section 29, 3)

provided that "the rents of the cottages shall be so fixed as to secure a *reasonable return* on the expenditure." The Local Government Board for Ireland attempted to arrive at this reasonable return. In the draft rules they issued under the Act they invited the several local authorities to specify the percentage return, but the amounts suggested were so irreconcilable that the Board dropped the matter apparently as an impossibility. This provision was bound to be inoperative, as an Irish labourer could not afford to pay for housing more than 1s. or 1s. 3d. per week. The science of economics, inexact though it be, had certain fundamental principles accepted as sound by rational men. It was held that in matters of general importance to the community at large the State could do things better than any individual or section of individuals. Hence the State should do so. This principle they must endorse in view of the benefits of State intervention in the matter of national education, national communication (post, roads, and railways) public defence, public sanitation, &c. But a definite line of demarcation could be drawn between what was of national concern, and what was of individual importance, or what was an individual responsibility. And the State should not undertake to do for one section of its citizens what it was not prepared to do for all. It admittedly should afford its people facilities within limits for their betterment, and should secure for the producer access to the means of production. Having done so the responsibility attached to the individuals to utilise or bury their talents. It was its proper function to enforce, but not to undertake, the performance of duties devolving on individuals, or to intervene in matters of individual concern. If the provision of housing accommodation was held to be its legitimate duty, where would the application of the principle end? Granting that it might afford facilities, it was no more its function to provide a man with a house than with a housekeeper, for, if so, State Socialism must merge into Communism pure and simple. Dr. Plehn, author of a standard work on public finance, laid down clearly the relative relationship of the Individual and the State. He said: "It is impossible to approve on *a priori* grounds of every intrusion of the State into fields hitherto set aside for the individual. Only when such intrusion does *not lessen* individual power, energy, ambition, and ability to advance, is it permitted. And only when it promises definitely to increase the importance of the individual, in the long run, is it desirable." And, lastly, he truly stated: "The two opposing theories as to the proper sphere of the State, Individualism and Socialism, *stand for two grand truths*. The one for the truth that the individual if he is to accomplish his manifest destiny must be allowed or assured room enough for the free exercise of his powers, so as to develop them and expand. Such individual development is necessary for the advance of society. The second that the State affords the individual the surest means of obtaining the assistance of his fellows so necessary to his own complete manhood." The present position of affairs was a striking instance of the anomalies of Statecraft. If they had the State ownership of land there would then be some reason for the State ownership of houses. But the car, so to speak, was being put before the horse;

two principles were adversely at work. The creation by law of individual ownership in that natural element, which all men are born heirs to, marked the zenith of individualism. On the other hand the provision of houses by the State, a function which came directly within the scope of individual effort, embodied a communistic principle of a sectional character, and in operation entailed a huge loss to the community at large, which could be avoided if individuals vested by the State with special rights and privileges were compelled to do their duty.

COUNCILLOR A. B. PLUMMER (Newcastle-on-Tyne) said that they were all wishful to obtain cheap buildings for the working classes, but he thought there was danger of making a minimum of cost the main aim, and by doing so, for various reasons, they defeated their object. The chairman mentioned that various trusts and companies had provided more houses in the Dublin district than have been erected by other town authorities in the whole of Ireland. He found upon consideration that the chairman's figures for Dublin worked out at about £160 a dwelling. It had also been mentioned that the contractors for the two prize design cottages at the Dublin Exhibition were only prepared to build similar cottages at an *approximately* similar cost, and on consideration that they were employed to erect *a considerable number* of houses at the same time. It should be remembered, that in all cases of prizes being offered for any work, a large amount of time and material were given free in order to obtain the rewards offered and the publicity gained. It should be noted, however, that the stated cost of such cottages did not, as a rule, include necessary external conveniences, boundary fences, and drains. If individuals and companies in country districts and towns were not unfortunately at first misled as to the expected cost, so many anticipated schemes would not be abandoned when it was found that only one or even more cottages, under less favourable circumstances, would cost from at least 30 to 50 per cent. more than exhibition model cottages. Such cheap cottages were, as a rule, built upon level sites with suitable foundations near the surface, and frequently having sand, gravel, and bricks on or near the ground, and, as a rule, having railway conveyance in proximity. If houses were to be built in country districts at a similar cost, as is generally expected, and under different circumstances and by-laws, an amount of necessary work has to be omitted, and as a rule this includes sanitary work, which certainly should not be constructed with a minimum of cost as the main object. He desired as an architect to state, that from practical experience he found that it was a hindrance to the erection of cheap cottages, to educate the public to expect them to be built for figures that are impossible under altered circumstances.

MR. M. J. TIGHE (Galway) said the financial part of the question had been fully and ably explained, but he would have wished for fuller details as to the actual housing. Surely it was not the intention to encourage the erection of those quaint structures of which they saw samples at the exhibition in Pembroke

Park. It was clear to anyone acquainted with the conditious of rural life in Ireland, and particularly on the western seaboard, that those buildings were hopelessly impracticable. What a labourer wanted above all things in his cottage was a spacious and comfortable living room. In the only cottage he visited he noticed a living room 12 ft. × 10 ft. with four doors, one of them an external door, two windows, and a fireplace. To him that room was eminently suggestive of the drawing room so dear to the writers of modern farcical comedy, where every available square foot of canvas walling was utilized for an opening of some kind or other, so that all sorts of undesirable characters could be disposed of at a moment's notice on the approach of the too confiding wife or husband. They were not educated up to those social complications on the west coast, and as a living room pure and simple the one he inspected would be uninhabitable for six months in the year and be uncomfortable for the rest. Mr. Cowan stated in his address that "until the present year designs for cottages under the Labourers (Ireland) Acts were prepared by architects for the local authorities." He was afraid the word "architects" was rather a misnomer used in that sense. He had been through most of the Irish counties of late years and was acquainted with practically every type of cottage erected under the Labourers Acts, and he could not call to mind even one instance in which the services of a properly qualified architect had been requisitioned. If the sentence had read "designs were prepared by handy men, local publicans, and road menders," it would have been nearer the mark. As a matter of fact, one of the greatest obstacles in the way of the efficient working of those Acts was that in no case was the necessity for proper professional supervision recognised. An attempt made to remedy that defect under the present Act was only accentuating the evil. Formerly, when cottages were to be erected, plans and specifications had to be prepared locally. That, at least, insured that the person appointed to carry out the cottages had some knowledge, however slight, of the work. Now, they were told, sets of lithographed plans were issued broadcast accompanied by a wonderful specification concocted to suit every condition.

Dr. Boobbyer (Nottingham) remarked that the subject of housing was such a large one, and the time for its discussion so short, that the only satisfactory plan was for each speaker to confine himself to one or two details, and to discuss them as fully as possible. He wished to emphasize the necessity, which existed in many large cities, of providing dwellings for those workpeople who, like dockers and market porters, were compelled to live near their work. Such work often lay near the centre of cities. The dwelling, therefore, must have the same situation. Tenement blocks, he thought, were the only possible solution of the difficulty in many instances, but people of the class referred to could not usually be relied upon to live decently, and generally play the part of good citizens, in such dwellings, except with the aid of binding regulations affecting their conduct. Too much had been made of the fetish of liberty in Great Britain.

Popular speakers on the subject were apt to forget that liberty was a relative thing, and more especially was it relative to social standing and obligations. The good middle-class citizen, if he would maintain his position as such, was prevented by the law of conventional respectability, if not by his own moral sense, from doing many things which the proletarian did continually, without hesitation and with absolute impunity. It was bad for the hooligan, but still worse for his neighbours, that the said hooligan should be allowed with impunity to play the beast and the ruffian. But so exaggerated was the public respect for the, so-called, liberty of the subject, that even in so comparatively small a matter as the nuisance caused by throwing banana skins on public roads and pavements, it was difficult to induce local authorities to apply for preventive by-laws. His contention was, that as no decent, thoughtful person would think of endangering his neighbour's life and limb by throwing a banana skin on the pavement, he was justified in insisting that others should be prevented from doing so, and drilled into good behaviour by definite police regulation with a penalty attached. Much good had been done in several large towns by Miss Octavia Hill's system, combining rent collection with the supervision of dwellings and their tenants. In Nottingham such a system had long been in force in connection with the management of the Corporation dwellings. The Social Guild of that city collected the rents of the Corporation houses, and received a certain percentage of the rental for doing so and for seeing that their inmates behaved as good tenants and good citizens. The Social Guild had full control over the tenancies, and if a rough tenant proved unamenable to reason he or she had to go. A large part of the squalor and insanitariness of the slums was due to remediable faults of slum-dwellers, and faults remediable by restrictive regulations adequately enforced.

DR. A. K. CHALMERS, MR. J. A. DUNCAN, and MR. J. MUNCE also took part in the discussion.

COULD THE EXISTING STATUTORY AND DEPARTMENTAL REQUIREMENTS AS TO SEWAGE DISPOSAL BE RELAXED IN CERTAIN CASES WITH ADVANTAGE TO THE COMMUNITY?

By W. KAYE-PARRY, M.A., M.Inst.C.E., F.R.I.B.A.

(FELLOW.)

THE object of the present discussion is to elicit expressions of opinion both from professional men and urban and district councillors as to the desirability of relaxing, in some cases, the present statutory and departmental regulations relating to the discharge of sewage into rivers and streams.

The writer ventures to suggest that the discussion should be limited to those parts of the water courses which are not affected by tidal influences, and that the desirability of discharging sewage into tidal waters or into the sea should not be now considered.

The necessity for some regulations and restrictions in cases where the sewage is intended to be delivered into tidal waters or into the sea is not denied. Indeed, it would appear that a Foreshore Pollution Prevention Act is needed to safeguard the coast towns from the nuisance which is in some cases created by the delivery of crude sewage at outfalls so situated that the polluting liquid is not effectually carried out to deep water and dispersed.

But the towns which were present to the mind of the writer when he suggested the subject for debate were those which are so circumstanced that the sewage either with or without treatment must eventually find its way into the nearest or most suitable river or stream.

Having regard to the fact that this Conference is in Dublin, it would add greatly to the value of the opinions elicited if the speakers

would address themselves to the subject as it presents itself to those of us who live in Ireland, and who are desirous of doing something in our day and generation to encourage the authorities in our country to take steps to improve the sanitary condition of some of our smaller towns and villages.

The conditions which obtain in this country are very different from those which are found in many of the thickly populated counties in England. Our population is small and is not increasing, and our country towns are not as prosperous as many of those in the more favourably circumstanced sister country. The rateable values are small, the area of charge is necessarily restricted, the borrowing powers are meagre, and the taxable capacity of the ratepayers is also very limited. The small shopkeeper in many of our little towns is a poor man who has a struggle to make a livelihood, and who is unable to bear the burden of a heavy sanitary rate.

The writer's experience has convinced him that the principal reason why urban councils are so slow to embark upon schemes of drainage and of sewage disposal is the consciousness that a complete and effective system of sewers, together with fully equipped works for sewage treatment, would place a load upon the shoulders of the ratepayers which they are unable to bear. Such a scheme may appear to be almost a necessity to an engineer or a medical officer of health, but to the townspeople it savours of a counsel of perfection which need not be seriously entertained.

Hitherto it has been the practice of the Local Government Board of Ireland to require installations of the same character, and capable of doing the same work, as those which are required by the Local Government Board of England. We are all of us prepared to appreciate the desire on the part of the Board to place our towns in as good a position in these matters as those of our English neighbours. If the public health necessitates the best and most effective works for the treatment of sewage, why, it is asked, should we lag behind England? Must we not exert ourselves to provide the means for the construction of these works, even if the expenditure involves great sacrifices from the long-suffering ratepayers?

This argument would be unanswerable if it could be demonstrated that any relaxation of the present regulations would have of necessity an injurious effect upon the health of the community, having regard to the distribution of our urban and rural population. But it must not be forgotten that in Ireland the rural districts are very thinly populated, and this sparse population very seldom depends upon the rivers on which our

towns are situated to afford them a supply of potable water; nor are there many towns where the river water is used as a source of supply.

Generally when a town embarks upon a scheme for water supply, the engineer is able to select a watershed within a reasonable distance from which a gravitation supply is obtainable. The writer is aware that there are some cases where the river water is pumped up, filtered, and distributed, but this is quite the exception. On the other hand, the towns which have no proper waterworks usually rely upon wells, so that the cases where the water of a river which has passed through a small town, village, or hamlet, is afterwards used for supplying some other centre of population with water are comparatively rare.

Again, many of our rivers are relatively large compared with our towns, whereas in the thickly populated counties of England these conditions are often reversed.

The gravest danger to public health in many of our Irish towns arises from the pollution of the wells due to leakage of sewage from the sewers and drains. Very often the resources of the ratepayers will not admit of the construction of new sewers and purification works. Loans will not, as a rule, be sanctioned for the sewers unless purification works are also provided. The practical result is, in many cases, that nothing has been done to improve the sewers, and nothing will be done, perhaps for many years to come, unless some relief is obtained from the present regulations.

It often happens that the river on which a town is built is so situated that the water is never used and never will be used for dietetic purposes below the town. Given these conditions, is it wise for the sake of a mere sentiment to prohibit the discharge of the partly purified or clarified sewage into such a river, when the other alternative is the permanent pollution of the wells from which the inhabitants obtain their drinking water?

The writer does not suggest that under any circumstances it would be permissible to sanction the discharge of untreated or partly purified sewage into any stream or water course if it could be shown that such discharge would either create a nuisance or expose the riparian owners or others, or their cattle, lower down to any danger to health. He is, however, of opinion that, provided the solids are removed as effectually as possible by some simple mechanical means, and provided the sewage is diluted with a sufficient volume of fully aerated river water, no real harm will be done if the water is not used for dietetic purposes. Even in cases where there is a very remote danger of such a contingency, he is not sure that the great benefits which would accrue to the comparatively large population of the

town by the construction of a proper system of watertight sewers might not outweigh any possible harm which might result from the discharge of imperfectly purified sewage into the river.

So far as nuisance goes, he believes that, provided the solids are removed by subsidence, efficient mechanical screening, or some other simple expedient, the dilution alone with the pure water will render the creation of a nuisance almost impossible, provided always that the river contains a large volume of water compared with the volume of sewage. But further than that, he is satisfied that it can be demonstrated that the presence of the dissolved oxygen in the pure water has a directly beneficial effect in promoting healthy aërobic fermentation in the sewage which will effect ultimately the same result at present obtained by contact beds or continuous filters.

It has sometimes been contended that dilution of sewage with clean water is not a proper substitute for the purification of sewage by bacterial methods, but perhaps the answer to that objection is rather outside the legitimate sphere of an engineer's knowledge and experience, and the writer leaves it to the distinguished chemists who have promised to take part in this discussion to express an opinion on this question. He is quite willing to content himself with pleading for those poor little towns which are unable to face the comparatively great capital outlay that is involved in the establishment of a modern sewage purification installation, and which on this account are precluded from carrying out the smaller and less costly, but much more necessary, work of providing watertight, self-cleansing sewers for the effectual drainage of their town. Such sewers are, in the writer's opinion, indispensable for the protection of the wells of the town from pollution, and the subsoil from saturation with sewage from the badly constructed, foul, and leaking sewers which to his personal knowledge still exist in so many places.

DR. W. E. ADENEY (Dublin) said that he thought that the subject which Mr. Kaye-Parry had introduced for discussion might be considered from two different standpoints: the technical and the administrative. He should confine his remarks to the first, merely expressing in passing his conviction as regards the second, that any change of statutory and departmental regulations which might become necessary would soon follow any real advance in their knowledge of the principles and practice of sewage disposal. Before radical changes could be hoped for it would be necessary for chemists, on the one hand, either to find a key to the more precise interpretation of the results obtainable by the methods at

present in use for the analysis of sewage and of sewage effluents, or to put forward more exact methods of analysis; and for bacteriologists, on the other hand, to discover more precisely than was then known when pathogenic germs ceased to multiply, and when they lost their poisonous properties, under the conditions which obtained when the sewage or sewage effluent in which they were borne was submitted to artificial purification, or to natural purification after discharge into river water. Engineers also should be agreed as to effective forms of tanks and screens for the separation of solid matters. There could be no doubt as to the necessity of removing the heavier suspended matters and floating solids of sewage. They ought on no account to be allowed to be discharged into a river. Bacterio-chemical investigations had, however, shown that liquid matters of sewage, and such finely divided suspended matters as escape through fine mesh screens and from effective subsidence tanks, provided they did not exist in larger quantities than three to four parts per 100,000, could be discharged into a stream without danger to fish life, if the volume were small in comparison to that of the river water at any time, and if it contained no poisonous chemicals, or itself were not in a poisonous putrefactive condition. This opinion was steadily gaining ground amongst experts, especially in America, where, in reference to potable water supplies, it had come to be regarded by some as a better policy "to accept a moderately polluted source of water for a public supply and thoroughly to purify its water, rather than to go to large expense in obtaining a faultless supply which might have to be purified in its turn at some later day." These words were quoted from the American author, Prof. W. P. Mason ("Water Supply," 1898). The speaker quoted from the writings of another American author, Mr. Earle B. Phelps, published in Vol. III. of the "Contributions from the Sanitary Research Laboratory of the Massachusetts Institute of Technology," Boston, p. 127, in support of his statement as follows:—"In England, where the subject of streams pollution has received careful study, the opinions of the experts on this question of standards vary greatly. The late Sir Edward Frankland (1902), in his testimony before the Royal Sewage Commission, restated the proposition advanced by him in 1874, that 'there is no river in the United Kingdom long enough to effect the destruction of sewage by oxidation . . .'. On the other hand, the position taken up by Rideal, that all free oxygen, as well as the oxygen of the nitrates and nitrites, is available to complete the oxidation of the remaining organic matters, was supported by much testimony. The same views are embodied in a test proposed by Adeney (1895), who would incubate a sample of the effluent after diluting with river water in the proportion in which the two are mixed in the river. Then if no putrefaction occurs the effluent is satisfactory. This test represents the extreme view of that school of sanitarians who hold, that if a partially purified effluent can be supplied with sufficient available oxygen for the complete oxidation of the remaining organic matter, it may with safety be discharged into the stream, and the purification will be completely carried out

within the stream. In justice to this view, it should be stated that what is here attempted is apparently not the protection of the streams from pollution by diseased germs so much as an apparent nuisance in, or fouling of, the stream. The evident intention is to keep the stream in such a condition that it may be rendered fit for domestic use by further purification of the water. With our present knowledge at least this would seem to be the wiser provision." This quotation indicated the position of the subject before them for discussion. It was generally understood that the existing Statutory and Departmental Regulations were more or less based on the results of the classical filtration experiments by Sir E. Frankland, and upon the conclusions he drew from them and from other investigations. His experiments were, and would always remain, models of accurate scientific investigation; but as he was unaware of the true agencies at work in river waters for their self-purification after pollution, namely fermentive changes induced by water bacteria, it was not surprising that some of his conclusions had since been found ill-founded, and one of these had been his statement above quoted, namely, that "there is no river in the United Kingdom long enough to effect the destruction of sewage by oxidation." As a matter of fact, it had been ascertained that the so-called self-purification of polluted river waters, when properly examined, proceeded with comparative rapidity. For example, Prof. Letts and he had found, during a tour of inspection of the chief estuaries round the English coast three years ago, that the waters of the Rivers Aire and Don, at their junction with the Ouse, were practically free from unoxidised organic substances. In other words, they had obtained evidence which showed beyond doubt that, notwithstanding the heavy pollution of the upper reaches of these two tributaries of the Ouse, by both trade wastes and sewage matters, their waters had undergone complete self-purification from the polluting organic matters originally discharged into them, by the time they reached the Ouse. It was right to add that although these tributary waters were free from polluting organic substances in *solution*, they nevertheless brought down large quantities of foul sewage solids into the Ouse during freshets after dry weather and poisoned its waters, rendering them for the time being impossible for fish life. Mr. Phelps was not correct in referring to the test, which he had proposed in 1895, as an incubation test. It was really a standard, based upon an aëration test, for the protection of river waters against over pollution. The practical difficulty which had up to then proved an obstacle in the way of revision of the existing regulations had been the impossibility of formulating standards of impurity on an accurate scientific basis. British chemists were practically agreed that such standards must be based on some form of aëration test, but they were not yet agreed upon the precise form the standard should take. The subject was one of much difficulty, and it had not been submitted to accurate investigation by many chemists. A good deal of work had, however, been done upon it, and this had been fully described and discussed in a joint Report on "The Pollution of Estuaries and

Tidal Waters," by Prof. Letts and himself, to the Royal Commissioners on Sewage Disposal. The great difficulty in the way of a practical utilization of aëration tests in general laboratory practice had been the want of a simple and accurate method for carrying it out. The methods employed in his original investigations were too slow and laborious to warrant them being introduced as ordinary laboratory methods. He had, however, described in the report referred to a modification of them, which enabled both the rate of absorption, as well as the total absorption, of atmospheric oxygen by a sewage or sewage effluent, to be determined rapidly and simply. The new method was capable of several simple modifications in application, according to the objects in view, and he hoped that it would prove the means of making it possible to examine sewage and sewage effluents by aëration tests as a matter of routine practice. From experiments which had been made, it appeared that the aëration of river waters must not be reduced by pollution below 4 cc. of oxygen per litre, otherwise fish life would be in danger; and if the de-aëration were carried to completion, the waters would become fouled and offensive. In considering the question of the maximum allowable pollution of river water, or in other words the maximum allowable rate of de-aëration of the river water by pollution, the converse condition, the rate of re-aëration, must be taken into account. Experiments which had been made upon this subject showed that, under calm weather conditions, that is under conditions least favourable for the re-aëration of large volumes of water, the rate for deep sluggish waters could not exceed 0·03 cc. oxygen per litre per hour. It was much more rapid for sea water, about 0·08 cc. oxygen per litre per hour. Taking this factor into consideration, a standard which would safeguard fish life and preserve a river from all danger of being fouled or over-polluted might be formulated as follows: the sewage or effluent to contain not more than 4 parts of suspended solids per 100,000, and the aëration of a mixture of an average sample of it with a sample of the river water in proportions of the average daily dry-weather flow of the sewage and of the flow of the river at its lowest state, respectively, when kept out of contact with air at 18° C. for 48 hours, should not be reduced below 2·5 cc. oxygen per litre. Such a standard would allow a river water at its lowest state to be polluted with two to four per cent. of fresh liquid sewage, and experience had shown that when the discharge of liquid sewage matters into a river did not exceed such small limits, its waters were not endangered save for potable purposes. He thought that no river water, whether known to be polluted or not, could be regarded as wholly safe for potable purposes without adequate filtration. One important factor must not be forgotten in connection with the discharge of liquid sewage matters into river water. It was the position of the outfall sewer. It must be so placed that the sewage from it would be rapidly mixed with river water to an extent that would make it innocuous before it could be carried into slack water in an insufficiently diluted condition. Obviously, also, an outfall sewer should not be erected in close proximity to an existing bathing place, and *vice versâ*.

MR. WILLIAM FAIRLEY (Westminster) said that the statutes bearing upon and governing the pollution of streams in Ireland were the Public Health Act (Ireland) and the Rivers Pollution Act, which latter was in force over the whole of the British Isles, so that the conditions and requirements bore a close resemblance to those obtaining in England and Scotland. Mr. Kaye-Parry's contention was that sewerage works and sewage disposal works might in many cases be considered separately, and the natural purification consequent upon dilution in rivers of fair volume taken advantage of, thereby lessening the burden on the ratepayers, so long as no nuisance or annoyance to owners was occasioned, and this he thought was reasonable and fair. He held that the question of sewerage should be regarded as distinct from that of sewage disposal. To provide a system of watertight sewers was now a necessity in all towns and populous places, for the purpose of avoiding contamination of wells, etc. He agreed with Mr. Kaye-Parry that the high standard necessary in the thickly populated parts of England need not be required where conditions in Ireland were so different.

PROFESSOR BOSTOCK HILL (Birmingham) said he spoke as medical officer of the county of Warwick, where they had the largest sewage works in the world, and also a large number of installations varying in size. Apparently the proposition of the reader of the paper was that under certain conditions they were to connive at local authorities breaking the law. Under the law at present the discharge of untreated or insufficiently treated sewage into a river was prevented, and he could not see how any county council could allow such a thing to be done. It seemed to be implied that the suspended matter in the sewage was the most important thing to get rid of, and while he admitted that it was of great importance, still, however clarified a sewage might be, yet in the course of a few hours, and particularly in hot weather, secondary decomposition would take place, and nuisance would result further down the stream if nothing had been done to deal with the matters in solution. The cause of the failure of many schemes had been that they were carried out on insufficient lines. In other words, where it was suggested to a local authority that they ought to spend £20,000, they had been content to spend half or two-thirds, and disaster had resulted. He suggested that Mr. Kaye-Parry's partial treatment would lead to that result, which was one they wished to avoid. Then Mr. Kaye-Parry said that in Ireland the main point they were desirous of looking to was the prevention of the pollution of wells. He took it that in a town where the wells had existed for a considerable time with cesspools and leakage there would already be a great deal of pollution, and he did not think the making of impervious sewers, and allowing sewage to discharge straight away, would, for months or years, prevent the pollution of the wells that now undoubtedly existed. In the case of a small town with a large stream, if there was no nuisance to the eye, and the water was not used for drinking purposes, he did not think anyone would suggest that action should be taken against the authorities. They had to deal

with cases as they existed, and if there was any sign of pollution it was the duty of the county authority to prevent that pollution.

Prof. E. A. Letts (Belfast) said that it seemed to him the subject under discussion presented three aspects—the hygienic, the purely scientific, and the administrative. Regarding the first, he would take what he presumed would be a typical case, from Mr. Parry's point of view, namely, a small, badly-sewered town on a large river which was not used lower down for drinking purposes by human beings, and that the water used in the town was supplied by wells; and further, supposing that there was evidence that sewage got into the wells; then any one who had the administration of affairs in his own hands would sanction a loan for new sewers without imposing the condition of sewage treatment as well, and some might very probably even go further than Mr. Parry suggested and not even insist on clarification by subsidence, provided the river was sufficiently large and sufficiently swift; for it was of course common knowledge that the sewage of certain towns, often of by no means inconsiderable size, was thus disposed of without any evil consequences. Take the City of Gloucester, for example, with a population of some 48,000, which discharged the whole of its crude sewage, amounting to about a million gallons daily in dry weather, into a branch of the Severn, which was locked about half a mile below the point of discharge, and was non-tidal except during spring tides, when the bore shot the weir at this lock. This method of disposal appeared to be satisfactory, and he had heard of no complaint, the reason being that enormous dilution occurred, amounting in dry weather to about 300 times. From personal tests he knew that even close to the outfall there was abundance of dissolved oxygen, and he did not think that fish could be injuriously affected or even inconvenienced in passing through the polluted zone. He was therefore convinced that there were numerous cases where no harm could be done by discharging sewage, either clarified or raw, according to the local conditions, into a non-drinking water stream. And also that such method of disposal was the most reasonable, the most economical, and the most satisfactory, where the conditions were favourable; while on the other hand he took it that it was essential to prevent at all costs the fouling of wells. The question which Mr. Parry put, "Was dilution of sewage with clean water a legitimate substitute for bacterial treatment?" might be called the purely scientific aspect of the subject, and he would unhesitatingly answer the question in the affirmative, with the reservation that this method of treatment was not a substitute for, but *was* a method of, bacterial treatment. As Dr. Adeney was an authority on this matter he need not enter into it in detail. Any experiments he had himself performed had been with 1 per cent. mixtures of sewage and sea water, and these had shown that even under the least favourable conditions (when kept out of contact with the air) such mixtures would not putrefy or give rise to a nuisance. The mixture gradually purified itself by means of the dissolved oxygen in

the water, which it absorbed under the influence of bacterial agency, the dissolved oxygen sufficing for the oxidation of the constituents of the sewage. Regarding this question of the purification of sewage by the dissolved oxygen of the diluting water, he might quote a passage from the views he expressed in 1903 in reply to a circular letter sent out by the Royal Commission on Sewage Disposal, soliciting the opinions of those who had paid attention to the matter on the subject of standards for sewage effluents:—"For it may be assumed, I think, that fouling only occurs in an effluent or in an effluent diluted with water, when the dissolved oxygen and the nitrates (supposing these latter to be present originally) have disappeared,* and consequently there is always a certain ratio which may be called the 'limit of safety' between the volume of sewage effluent which should be permitted to flow into a watercourse, and the volume of water, with which it is there mixed. Take, for instance, the case of two inland towns of the same size, one situated on a large and the other on a small river. The thing to be avoided is the fouling of these rivers, and it seems to me to be absurd to compel the town situated on the big river to purify its sewage as highly as the one on the small river. It would, I think, be almost as reasonable to compel all towns situated on the sea coast to purify their sewage to the same extent. Again, suppose that 'non-putrescibility' of the effluent is taken as a standard; the idea is excellent in the case of a large manufacturing district with a stream which is more or less a sewer, but why force this standard upon the town situated on the big river? Nature has given that town an asset of great pecuniary value in the shape of its river, which is capable of doing most, if not all, of the work in the purification of its sewage. Why should its ratepayers not enjoy that advantage?" In reference to the administrative aspects of the question of sewage disposal, certain requirements of the Local Government Board in relation to the various systems employed, the capacities of tanks, contact beds or sprinkling filters, etc., are collected and tabulated in a sheet by Mr. Adams, a sheet which he fancied was to be found in the offices of most sanitary engineers. Recently, however, he heard on high authority, to his surprise, that there were no official requirements printed or circulated by the English or Irish Local Government Boards. He was interested to know how this matter stood. But, however that might be, did we not all feel that in questions of sewage disposal, as in most other questions, "circumstances alter cases"? And did we not all hope that before long, at all events, the main jurisdiction regarding questions of sewage disposal would be in the hands of separate Rivers Boards, who would, to a large extent, control all matters affecting their watersheds, whether in regard to pollution, fishery, or other questions, subject possibly to some higher court of appeal?

* Some recent experiments of my own have shown that septic tank effluent will completely decompose nitrates corresponding with as much as 2·5 parts per 100,000 of nitric nitrogen in less than 24 hours.

Professor E. J. McWeeney (Dublin) observed that the discussion revealed two opposite trends of thought. The speakers from England, where the population was dense and increasing, favoured rigid adherence to a high standard of requirement. Those who came from Ireland, impressed by the dwindling population and relatively large size of the rivers, were in favour of less rigid standards. This was not to be wondered at, seeing that some large towns in Ireland, such as Cork and Limerick, drew their supply of potable water from the Lee and Shannon respectively, both of which received the crude, untreated sewage of Macroom and Castleconnell, small towns some miles up-stream. This was not satisfactory, yet the consequences had not been very alarming. The fact was that the dilution was so great, and bacterial action so vigorous, that one might almost say that these small towns possessed bacteria-beds for the treatment of their sewage, the beds being diffused, as it were, through the large rivers into which the sewage was poured. He thought that if the removal of the suspended solids were made a *conditio sine quâ non*, the local authorities might well go a step further and treat their effluent on contact beds. The additional cost would not be great. The disadvantage of pouring in untreated or imperfectly treated sewage into non-potable streams was the destruction of fish and the æsthetic evil, making itself felt more especially in summer time. They had in Ireland at least one sort of manufacturing effluent, treatment of which should be rigidly insisted on—that from creameries. It was liable to undergo a highly offensive form of putrefaction, and, moreover, appeared to be dangerous to animals that drank from the watercourses so polluted.

Mr. Peter Fyfe (Glasgow) stated that, in view of the paper by Mr. Kaye-Parry, he had written to the chief engineer of the Glasgow Sewage Works to ask what was the cost of treating the sewage in that city. It was well known that Glasgow was rather a heretic in sewage matters, and preferred to treat the sewage by precipitation rather than by the bacteriological method, which the authorities there did not consider practicable for large manufacturing towns. He read to the Conference the chief engineer's reply, from which it appeared that, whereas the precipitant formerly used in Glasgow was sulphate of alumina and lime, costing £1 7s. 2½d. per million gallons of sewage treated, they were now using persalts of iron manufactured by themselves on the McCulloch process, and were doing equally effective work with it for 9s. 2½d. per million gallons treated. The filtration of the effluent cost another 1s. per million gallons, after which filtration it was fit to be put into any running stream. The whole cost (including working expenses) of treating a million gallons of sewage in Glasgow was now £1 14s. 9d. If such a system were adopted for a small town, the cost of treatment would therefore be very little, and he thought it was in this direction that Mr. Kaye-Parry might find a solution of his problem. Of course, there was the disposal of the sludge in any treatment by precipitation; but, even by the bacteriologic method, there were certain solids which could

not be removed by bacteria, and the bacteria beds themselves also required intermittent attention to keep them efficient. He was opposed to any sewage effluents which had not been sufficiently treated being permitted to enter into any stream if there was the slightest probability of its waters being used for dietetic purposes.

DR. G. J. FOWLER (Manchester) thought they should be quite clear what Mr. Kaye-Parry really meant. One or two had spoken of secondary decomposition, and they all knew that sewage which had been merely settled, or even sewage which had been treated with chemicals, would, if left to itself, afterwards decompose and cause a nuisance. But the point which Mr. Kaye-Parry wished to emphasise was whether, where the sewage was small in amount and the river water was large, nuisance would arise. They would be agreed that, providing certain conditions were favourable, nuisance would not arise, but it was very important that these conditions should be investigated in each case and carefully observed, and it would necessitate some observations of a character, perhaps, which not every local authority would go in for. In the first place, it would be necessary to know the relation of the volume of sewage to the smallest summer flow of the stream, because it was then that nuisance would arise. Further, it would be necessary that the point of inlet should be very carefully chosen, so that the effluent was properly mixed with the river water at once, and that the mixture should find a clear way down the stream. If there were small bays where eddies of imperfectly purified sewage were likely to be formed and the oxidation conditions would be bad, the likelihood would be that if they did not get decomposition they would get growth of sewage fungus. The removal of solids was not such a simple matter as was at first sight supposed. If they retained their solids in the tank they had a certain amount of sludge to deal with, and, of course, all the more if they used chemicals. Then the cost of chemical treatment did not end with the amount spent on the chemical. They had to pay for that addition and for the labour of adding it, and they had also to deal with the large quantities of sludge produced thereby. Moreover, if they had a tank its construction and dimensions would have to be very carefully considered. If they had it too large they had septic action arising and got an effluent which was not altogether suitable for discharging into a river. Another point which arose was in reference to storm water. While they might have a system of sewers which suited very well in dry weather, and brought everything down to the works, yet in stormy weather they might have difficulties owing to overflows. Storm overflows were liable to form permanent deposits, and he would urge on engineers having control of schemes of this sort to see that as much as possible of the sewage was dealt with. He had seen a great deal of nuisance and difficulty caused by storm overflows which completely nullified the good work done by purification works. He would also point out, in regard to the remarks of Dr. McWeeney, that bacterial beds in themselves were no safeguard as regarded

the bacteriological pollution of a stream. It made little difference whether they had 100,000 bacteria or 1,000,000 if they were still there. They knew that bacterial beds in themselves, although capable of producing an excellent effluent, were not sufficient to remedy any danger which might arise from the presence of bacteria. That, however, was a question which did not arise on the paper, as the presumption was that the water was not to be used for drinking purposes.

DR. S. RIDEAL (London) thought that the discussion had shown the urgent need, both in England and Ireland, for fresh legislation on the lines indicated in the third and fourth reports of the Royal Commission on Sewage Disposal. It was most unsatisfactory to find that no steps had been taken by the Government to bring about the creation of Rivers Boards to fix standards in the different watersheds, which would in certain cases enable towns to proceed with works that would effect a partial purification of the sewage discharged, and in his opinion would often bring about such a great improvement in the river below the offending town that no further treatment would be demanded by any authorities. Until, however, the Rivers Pollution Act of 1876 in England, and the corresponding Irish Act, were amended on these lines progress was delayed, and the Local Government Boards were powerless to depart from the unworkable ideals which were introduced into the clauses of those two Acts. He hoped that the Council of The Royal Sanitary Institute would take an early opportunity of petitioning the Government in favour of this much-needed reform.

DR. W. BUTLER also took part in the discussion.

CONFERENCE AT DUBLIN.

Section III.—PHYSICS, CHEMISTRY, BIOLOGY, AND METEOROLOGY.

THE CLIMATOLOGY OF IRELAND IN RELATION TO THE PUBLIC HEALTH,

By Sir JOHN W. MOORE, B.A., M.D., D.P.H.Dub., Hon.D.Sc.Oxon., F.R.C.P.I., F.R.Met.Soc.

THE Council of The Royal Sanitary Institute have selected two subjects for discussion in this section at the present Conference. These are—

1. "Disinfection considered from a Medical, Chemical, and Bacteriological Standpoint;"
2. "The Climatology of Ireland in Relation to the Public Health."

To me has been assigned the task of discussing the climatology of Ireland in relation to the public health. This I will endeavour to do as briefly as may be, laying under contribution an account of the climate of Ireland, which I prepared some years ago for the second volume of a work, entitled "The Climates and Baths of Great Britain and Ireland."

The claims of Ireland on those who are in search of health, of rest, of novelty in the midst of beautiful surroundings, are indisputable. No matter in what direction the traveller wends his way through the Emerald Isle, he will find much to interest and instruct, to charm and delight. Apart from the scenery which bewitches by its infinite variety, Ireland presents a field for archæological, legendary, historic, botanical, and geological research. The stupendous cliffs of the western shores, the fiords of Kerry and of Donegal, the towering basaltic headlands of Antrim, the sandy or shingly beaches of the eastern coast, and the land-locked bays of the south, present a never-ending kaleidoscope of scenic beauty Even within a few miles of the Capital the panoramic views from the slopes of the Dublin mountains, from the summit of Howth Head, or from Victoria Park, Killiney, are unsurpassed in loveliness.

That great master of the English language, Lord Macaulay, writes—

> "The south-western part of Kerry is now well known as the most beautiful tract in the British Isles. The mountains, the glens, the capes stretching far into the Atlantic, the crags on which the eagles build, the rivulets brawling down rocky passes, the lakes overhung by groves in which the wild deer find covert, attract every summer crowds of wanderers sated with the business and the pleasures of great cities. The beauties of that country are, indeed, too often hidden in the mist and rain which the west wind brings up from a boundless ocean. But, on the rare days when the sun shines out in all his glory, the landscape has a freshness and a warmth of colouring seldom found in our latitude. The myrtle loves the soil. The arbutus thrives better than even on the sunny shore of Calabria. The turf is of livelier hue than elsewhere; the hills glow with a richer purple; the varnish of the holly and ivy is more glossy; and berries of a brighter red peep through foliage of a brighter green."—"*The History of England from the Accession of James the Second,*" *by Lord Macaulay, Chapter xii.*

In choosing a health resort, one naturally asks whether a place is more suitable for summer than for winter residence, or the converse; and again, what places have a relaxing, what, a bracing climate. To answer these questions, it will be necessary briefly to discuss the climate.

But first, as to its geographical position, size, and geological formation.

Ireland extends from 51° 26′ to 55° 23′ N. lat., and from 5° 25′ to 10° 30′ W. long. The Atlantic Ocean encircles the island, which has the form of an irregular rhomboid, the largest diagonal of which, from Torr Head (Antrim) in the north-east to Mizen Head (Cork) in the south-west, measures 302 miles. Another measurement, from Fair Head or Benmore in Antrim to Crow Head in Kerry, gives 306 miles as the greatest length. The greatest meridional length, from Malin Head, the extreme northerly point, is not more than 225 miles. The greatest breadth between the extreme points of Mayo and Down is 182 miles, but from Dublin to Galway Bay the breadth is only 120 miles, and the average breadth from east to west does not exceed 110 miles. The total area of the island is 32,535 square miles, or 20,822,494 acres—it is, therefore, appreciably larger than Scotland, which has an area of 30,405 square miles.

A great undulating plain stretches across the centre of the country, rising in places to 280 or 300 feet above sea level, and having an average elevation of 200 feet. From Dublin Bay to Galway Bay this plain stretches from shore to shore. Elsewhere it is interrupted by groups of mountains, which range themselves for the most part near the coast line. In the south-west the mountains are in chains, running S.W. and N.E., and separated by long inlets of the sea, which form the far-famed and beautiful fiords of Kerry.

The central plain of Ireland rests for the most part on the Carboniferous Limestone, over which in several places there are remains of the Upper Carboniferous strata, or Coal Measures. Here and there in the central plain the limestone crops to the surface, but elsewhere it is overlaid by Boulder Clay, the result of glacier action; by the sands and gravels of a bygone shallow sea; or by the peat bogs, which tell of ancient oak forests and fir woods, which in time were killed by mosses and other peat-producing plants. Through evaporation from these water-soaked morasses or *bogs*, which, according to the estimate of the late Sir Robert Kane, M.D., cover 2,830,000 acres, or about one-seventh part of Ireland, the superincumbent atmosphere is rendered moist and cool. The vast peat-bog which occupies so much of the central plain of Ireland is called the Bog of Allen.

Mountainous districts are found in Donegal and Derry, Antrim, Down, South Dublin and Wicklow, Waterford, Cork, Kerry, Limerick, Tipperary, West Galway and Mayo, Sligo. From Galway to Derry the geological formation of the mountains consists chiefly of metamorphosed Lower Silurian rocks, a division of the Palæozoic strata between the Old Red Sandstone and the Cambrian. The Upper Silurian, under the Old Red Sandstone, is found in a range of hills between Killery Harbour and Lough Mask in Connemara, the highest peak being Muilrea (2,688 ft.). Rocks of the Cambrian age occur in Dublin, Wicklow, and Wexford. The highest summit is Lugnaquilla (3,039 feet), composed of altered Silurian rocks lying on the granite. It is interesting to note that granite reaches the sea level in the district extending from Dalkey to Blackrock, Co. Dublin.

The mountains of Kerry, Cork, and Waterford are built up of Old Red Sandstone in broad bands, the valleys being formed of narrow bands of Carboniferous rock. MacGillicuddy's Reeks, the loftiest range in Ireland, rise abruptly from the Carboniferous Limestone of the Killarney district, to attain in Carran-tual a height of 3,414 feet above the sea.

The inland summits of the southern half of the island consist of central cores of Silurian strata wrapped round with thick folds of Old Red Sandstone.

The Mourne and Carlingford Mountains probably belong to the Permian period, but consist largely of granite in various forms. The geology of East Derry and Antrim is very interesting. Triassic rocks are overlaid by the Oolitic or Jurassic and Cretaceous strata, the whole being extensively submerged by the great basalt flood which poured over the north-eastern counties and reached the sea at the Giant's Causeway. This far-famed natural formation consists of a series of terraces composed of

hexagonal basaltic pillars occasionally separated by bands of volcanic ash.

One of the most striking features of this island is its indented coast-line, particularly in the west and north. In many places this has resulted, as suggested by Prof. Edward Hull in his "Geology of Ireland," from the chemical action of the sea-water on the limestone rocks. Along the east coast these inlets have become largely silted up by sand; but in the south, west, and north of the island, they often form magnificent natural harbours, on the shores of which delightful health resorts do or might exist.

Mineral springs, chiefly chalybeate, exist in the upper limestone in many parts of the country. Of the spas the best known are those of Lisdoonvarna in Clare, Castleconnell near Limerick, Mallow in Cork. Swanlinbar in Cavan, Dunkineely in Donegal, Ballynahinch in Down, and Lucan, a few miles west of Dublin.

The soil is naturally fertile, composed largely of detritus carried down to the plains from the varied mountain strata. Strong retentive clay, sand, chalk, and gravel soils are almost wholly absent.

In 1672 Sir William Petty estimated the population of Ireland at 1,320,000. In 1824 it was 7,078,140 persons, 3,471,820 being males and 3,696,320 females. In 1845 it had increased to 8,295,061 persons, of whom 4,083,043 were males and 4,212,018 were females. This year saw the high-water mark of the population of Ireland. Fast upon its heels came the famine years, pestilence, and emigration, with the result that when the census of 1851 was taken the total population had fallen to 6,514,473, the males numbering 3,181,353, and the females 3,333,120. Fifty years later, in 1901, the numbers were 4,443,370; males, 2,192,397, and females, 2,250,973. In the middle of this year, 1907, the estimated population is given by the Registrar-General as 4,378,568—2,172,473 males and 2,206,095 females.

The temperature of the sea which washes the Irish shores has a far-reaching influence upon the climate. In January we find a mean sea-temperature as high as 44·6° at Cleggan, Co. Galway; and even at the Kish Lightship, nine miles off Kingstown Harbour, it is 44°, compared with 37° at Yarmouth and Berwick. In July, on the contrary, the mean sea-temperature at the Kish Lightship is 56·3°, or 4° below the mean temperature of the air in Dublin (60·3°). From these figures it is clear that the proximity of the sea is a source of warmth in winter and of coolness in summer. The isothermals indicative of the mildest British climate in winter are seen enveloping Ireland in January. The veteran Scottish meteorologist, Dr. Alexander Buchan, whose recent death we all

deplore, shows that the lowest temperature in winter is found in the interior towards the north-east, or lee, side of the island; and from this central area, in which the January mean does not exceed 40° F. (4·4° C.), temperature rises all round, but especially towards the south-west, on advancing in which direction it rises successively to nearly 45° F. (7·2° C.). In the summer months the warmest portion of Ireland is the south-east, and the isotherms in that district follow a course more nearly north and south than east and west. A tendency to *northing* of the summer winds also plays an important part in the peculiar distribution of temperature, as shown in the distribution of the isotherms over the west of Ireland in summer.

The actual facts are as follows:—In January, the isotherm of 40° embraces an oval-shaped area extending from the western, or inland, half of Antrim southwards to the counties Kilkenny and Carlow. The isotherm of 41° passes through Dublin south-westwards to Fermoy, and then curves towards north-west and finally north to the extreme north of the island near Lough Swilly. On the other hand, the isotherm of 45° sweeps southwards down the extreme western coast from Achill Island to Valentia. In July the isotherm of 58° skirts the north and that of 59° the west coast, while that of 60° embraces a large area extending from Upper Lough Erne southwards towards Cork. Tipperary and North Cork, with Kilkenny and Carlow, enjoy a mean temperature of 62°. The great Central Plain extending from Galway to Dublin is somewhat cooler—60·4° to 60·8°. This is, doubtless, due to the immense quantity of water with which the Bog of Allen and other less extensive peat-bogs are charged, as well as to the number of lakes in the centre and west of the country.

The smallest annual rainfall in the British Isles is at Spurn Head, Yorkshire, 19·1 inches, and at Shoeburyness in Essex, where the average for 25 years was only 20·6 inches. The only part of Ireland where the rainfall falls decidedly short of 30 inches is Dublin and its vicinity (about 28 inches).

The highest rainfall in Ireland is 86 inches, on Mangerton, a mountain near Killarney, but is based on only eight years' record. At Kylemore, in Connemara, the mean for 15 years is 77·6 inches; for a similar period at Dromore Castle on the Kenmare river, Co. Kerry, it is 60·2 inches. Derreen, Bantry, and Dunmanway, in the south-west of the Co. Cork, have a mean yearly rainfall over 60 inches. The highest rainfall in the north-west is recorded at Killybegs, on Donegal Bay, 57 inches; and in the east the highest is 50·6 inches at Newcastle, Co. Down.

In addition to the Dublin stations, which, as we have just seen, have a rainfall of about 28 inches, Dr. Buchan gives Dundalk (on an average of ten years) as having an annual fall slightly under 30 inches (29·9).

Classification of Irish Health Resorts.

With the above facts before us, we are in a position to roughly classify the Irish health resorts according as they are suitable for summer or winter residences, and according as they are dry, bracing and cool, or humid, relaxing and warm. As summer resorts, the watering-places on the north and east coasts are most suitable, such as Buncrana, Portstewart, Portrush, Ballycastle, Carnlough, Whitehead, Bangor, Donaghadee, Ardglass, Newcastle, Greenore, Laytown, Balbriggan, Skerries, Malahide, Howth, Kingstown, Dalkey, Killiney, Bray, Greystones, Wicklow, Courtown Harbour, and Rosslare. To this list may be added Youghal, on the south coast, and Kilkee in Co. Clare, as well as Dugort (or Doogort) in Achill Island, Enniscrone in Co. Sligo, and especially Bundoran, near the southern border of Co. Donegal.

As winter resorts, Newcastle, Co. Down; Rostrevor and Warrenpoint on Carlingford Lough, Sutton near Howth, Monkstown, Co. Dublin; Kingstown, Killiney and Ballybrack, Bray, Greystones, Queenstown, Glengarriff, Parknasilla, Co. Kerry; Salthill near Galway, Mallaranny on Clew Bay; and, as inland stations, Dundrum and Lucan, Co. Dublin; Delgany and Enniskerry, Co. Wicklow; and St. Ann's, Blarney, may be mentioned.

Speaking in general terms, the stations in the south and south-west of Ireland are more or less relaxing, particularly those situated at a short distance from the sea, such as Queenstown, Glengarriff, and Kenmare. Nevertheless, there are many invalids who do remarkably well at either Queenstown or Glengarriff. With regard to the former, the steepness of the hill upon whose southern slope it stands should be taken into account. On the other hand, Queenstown is more open, less surrounded by trees, and infinitely more stirring than Glengarriff. Both places are ideal spring resorts.

Among the most bracing watering places in Ireland are Bundoran, Co. Donegal; Portrush, Co. Antrim; Donaghadee and Newcastle, Co. Down; Kingstown, Greystones, and Kilkee.

During the year 1905—the latest for which full information is at hand, namely, in the Forty-second detailed Annual Report of the Registrar-General for Ireland, 75,071 deaths were registered. This number is equal to 1 in 58, or 17·1 per 1,000 of the estimated population. This

death-rate (17·1) is 1·0 below that for 1904, and 0·9 under the average for the preceding ten years. The recorded deaths in the four provinces give a death-rate for Connaught of 13·7; for Munster, one of 15·8; for Ulster, one of 17·8; and for Leinster, one of 18·3. The lowest rates were: Co. Kerry, 12·9; Co. Mayo, 13·2; Co. Roscommon, 13·2; Co. Leitrim, 13·5; and Co. Cavan, 13·8. The highest rates were: Dublin County Borough, 23·1; Belfast County Borough, 20·4; Co. Armagh, 19·3; Co. Wexford, 18·5; and Co. Tyrone, 17·7. In these figures we see plainly the unfavourable influence of city life and density of population.

The influence of season and weather is seen in the quarterly death-rates, namely, first quarter, 19·9 per 1,000 of the population annually; second quarter, 17·9; third quarter, 14·5; and fourth quarter, 16·1.

The chief acute infections, namely, smallpox, measles, scarlet-fever, typhus, influenza, whooping-cough, diphtheria, continued fever of undetermined type, enteric fever, diarrhœal diseases, puerperal septic diseases, and pneumonia in all its forms, together caused 8,871 deaths—a figure equal to an annual death-rate of 2·02 per 1,000.

These startling figures bring us face to face with the greatest and gravest of all the health problems which await solution in Ireland—the control of tuberculosis. If we go back to the year 1864, we find that the death-rate from all forms of tubercular disease in England and Wales was 3·3 per 1,000. In 1903 it had fallen to 1·7, rising in 1904 to 1·8, but falling in 1905 to 1·632. In Scotland, the death-rate was 3·6 per 1,000 in 1864, and in 1903 it had declined to 2·1. In Ireland we find no such satisfactory evidence of the influence of sanitation in checking the ravages of the plague, for, whereas in 1864 the death-rate from this infection was 2·4 per 1,000, it 1904 it had actually risen to 2·9, only falling to 2·71 in the year 1905, now the subject of review.

Facing page 24 of the Forty-second Annual Report of the Registrar-General for Ireland is a coloured map which gives the death-rate, per 1,000 of the population, from all forms of tuberculosis for each Poor Law Union, or Superintendent Registrar's District in Ireland for the year 1905. The results have been made correct by assigning the deaths in the various lunatic asylums and certain other institutions to the Unions to which the deceased in each case belonged.

As before stated, the general death-rate from tuberculosis was 2·71 per 1,000 of the population. It will be seen from the map that the Poor Law Unions having the lowest tubercular death-rates in 1905 were Tulla (Co. Clare), 0·92; Lisnakea (Co. Fermanagh), 0·93; Borrisokane (Co. Tipperary), 1·05; Castletown (Co. Cork), 1·07; Portumna (Co. Galway),

1·10; Dunfanaghy (Co. Donegal), 1·14; and Kenmare (Co. Kerry), 1·16; those having the highest death-rates were Londonderry, 3·35 per 1,000; Castledery (Co. Tyrone) and Kinsale (Co. Cork), each 3·48; Waterford, 3·56; Belfast, 3·85; Dublin, south, 4·38; Cork, 4·53; and, *horresco referens*, Dublin, north, 4·70.

Now, even a casual observer must be struck by the facts brought out by the foregoing figures. They are—

1. That a relatively low death-rate from tuberculosis prevails practically throughout the western half of Ireland.
2. That the highest death-rates are in the urban districts of Dublin, Cork, Belfast, and Derry.

These are precisely the conclusions to which the late Registrar-General for Ireland, Dr. T. W. Grimshaw, C.B., came, in a paper read before the Section of State Medicine in the Royal Academy of Medicine in Ireland on Friday, February 17th, 1899. The title of that important communication was "The Prevalence of Tuberculosis in Ireland, and the Measures necessary for its Control."

So long ago as the 16th of April, 1885, in a paper entitled "Observations on the relative prevalence of disease, and relative death-rates in town and country districts in Ireland," Dr. Grimshaw called the attention of the State Medicine Section of the Royal Academy of Medicine to the prevalence of phthisis in Ireland, and to its especial prevalence in Irish town districts. Again, on the 19th of May, 1887, he brought under the notice of the same Section of the Academy, a paper on "The prevalence and distribution of phthisis and other forms of disease of the respiratory organs in Ireland."

This triad of papers by Dr. Grimshaw should be studied by all statisticians, as well as by all students of State Medicine. They prove that tuberculosis is more deadly than all the other acute infections put together, and that it slays wholesale in large towns. The fact is that the slums and tenement houses of our old towns reek with the poison of tuberculosis, and that climate plays a very subordinate part in relation to the spread and fatality of this dread infection.

And speaking of climate in general and of the climate of Ireland in particular, I may frankly state that the latter is probably the most temperate climate in the world, as it is certainly the most conducive to health and to longevity. Only give Ireland a fully-equipped and efficient sanitary organisation; develop the beneficent work of Queen Victoria's Jubilee Institute for Nurses throughout the land; teach the people the supreme value of cleanliness of the person and of their home; impress upon

mothers, actual or prospective, the solemn duty of suckling their infants, of learning how to feed their children once they are weaned; convince fathers, brothers, sons, of the deadly effects of intemperance—do all this, and in a few years, at most within a generation, this fair island of the west will rank as one of the healthiest countries on the earth.

DR. J. R. KAYE (Wakefield) said that when scientific enquiry as to the actual influence of climate upon health was made (as distinct from comfort) little real knowledge was found to be acquired, or evidence scientifically applied on which to base conclusions. This was surprising after one had become used to the conventional habit of associating the two conditions of weather and health, and after noting the way in which the meteorological records were held up as advertisements by our health resorts. He did not deny that the weather was an all important factor at a health resort, nor that the thermometer and barometer should form part of a medical man's equipment. It was necessary that the visitor should have tolerable weather to cheer his spirits, and enable him to get the full benefit of the change of air and surroundings. But this was not the "public health." They were considering just now whether the public health of a country (Ireland to wit) is in any way affected by prevailing climatic conditions of the country. Very complete returns were published which enabled them to ascertain the death-rates at all ages and from all causes, and, as though recognising the relationship of the weather, the Registrar-General kindly included particulars of the meteorological observations of the period dealt with. But he carefully refrained from drawing any inferences or attempting to directly connect his two sets of tables. Of course they could not expect the two tables to run parallel for the simple reason that climatic agencies, however powerful for good or bad health conditions, would not immediately influence the death records for the given period. Yet if the influence operated at all uniformly and continuously it would amount to nearly the same thing, and they ought to be able to read some traces of the weather in the vital statistics of one locality in comparison with another. A study of the tables, however, soon convinced one that whatever might be the influence of the weather it was inferior to the effects arising from conditions of our own making, conditions of housing, occupation, material welfare, education, cleanliness, and sanitation in general. Sir John W. Moore claimed that the climate of Ireland was probably the most temperate in the world, and the most conducive to health and longevity. In the matter of temperature it was especially favoured by the mollifying influence of the ocean which warmed it in winter and cooled it in summer. Its rainfall was excessive on the west coast, and moderate on the east, and the records of sunshine showed more favourable conditions on the east than on the west, where Macaulay in his eulogy speaks of those "rare days when the sun shines out in all its glory." Altogether then the most congenial portion of Ireland

from a meteorological point of view was the east coast with its equable temperatures, greater sunshine, less rainfall. A comparison of the mortality statistics quickly showed, however, that these climatic benefits counted for very little owing to the bad effect of conditions made by man. The general death-rate was lowest in the south-west and west, and highest on the east and north-east, its maximum being at Dublin. The same statement was roughly correct with regard to zymotic diseases, tuberculosis, and diarrhœa, where the influences of aggregation and sanitation were more important than climate. There was one noteworthy exception to this rule of high rates in the east, and that was with regard to typhus fever, a disease which reigned amid ignorance and dirt. The deaths from this cause were fewest in the east, and most in the west; thus again showing that soap and water were more powerful than climate. Another example of the subjugation of climate was found in the infant mortality records. Atlhough the figures for Ireland generally were far better than ours, a comparison of its four provinces showed a most enviable state of things in the wild and squally regions of the west where there was excessive rainfall, plenty of mist and fog, and absence of sunshine. The infant mortality in Connaught in 1905 was only 65·2, whilst in Leinster with its more agreeable climate the rate was nearly double. In this they saw clearly the effect of town life with its artificial conditions and habits of life. It would be interesting to refer to the bacterial origin of many diseases, and to consider whether that discovery had tended at all to weaken the accepted connection of weather and health. Though he had no desire to discourage the scientific study of meteorological records in relation to the health of the people, he submitted that for practical purposes the public health depended more on the sanitary condition of the community than upon climate. Man was an accommodating animal, able to live and thrive under a wide range of natural conditions, but when he tried to accommodate himself to the unhygienic environments of modern industrialism he did so at a sacrifice. Ireland had every advantage in the matter of climate, but that alone was not sufficient. She must exert herself in the directions advocated by Sir J. W. Moore, pressing constantly towards the attainments of those sanitary ideals which it was the business of that conference to uphold. Given a country with a pure water supply, a clean atmosphere, sanitary dwellings suitably disposed with efficient drainage, a means for the prompt removal of refuse, a people educated in the principles and practice of hygiene, one might accept the meteorological readings with a secondary interest as affecting the comfort of the individual without threatening materially the health of the public.

Sir Charles Cameron (Dublin) said that a rise of temperature often brought diarrhœal diseases among children. There were very few countries that had a superior climate to that of Ireland. The mean temperature in winter and summer only varied 10 degrees. Then there was the absence of noxious insects and animals. There were no snakes in Ireland, although the fossils in rocks in Ireland showed there were many dangerous reptiles formerly. When in Dublin

the summer temperature was not very hot and the winter temperature high, the death-rate was low. He dreaded a hot summer or a cold winter. There never was a greater fallacy than that a green Christmas made a fat churchyard, at any rate in reference to that country.

DR. J. SPOTTISWOODE CAMERON (Leeds) said, while agreeing largely with Dr. Kaye that the causes of disease were to be looked for rather in the households and habits of the inmates than in meteorological conditions; that usually it was "not in our stars but in ourselves that we were underlings," he considered that the study of meteorology had still a great importance in health work. There was no doubt whatever that high temperature and drought during the summer months were associated with high infantile death-rate in large towns. In his own experience he had noticed that when measles was especially fatal it was generally in a period of anti-cyclone; when the barometer stood high. the difference between day and night temperature was great, and there was an absence of rain. In the latter case, he was inclined to think that the poison of measles, when present in the courts and alleys of our large towns, was kept in the neighbourhood of the houses by these conditions. During a comparatively hot day the germ, associated with more or less volatile particles, might be buoyed up even above the level of the houses; but there was no wind to carry it away, no rain to wash it down to the sewer, and, when the cold night came again, it returned to the neighbourhood of the dwellings. Both in autumnal diarrhœa, and in the measles outbreaks of spring, to some extent, the unfavourable meteorological conditions might be overcome by the use of the hose-pipe. Though fresh air was doubtless the great preventative of phthisis, it was fairly well known that a damp soil and damp air were associated with a heavier mortality from that disease.

MR. J. DILLON also took part in the discussion.

DISINFECTION CONSIDERED FROM A MEDICAL, CHEMICAL, AND BACTERIOLOGICAL STANDPOINT.

By S. RIDEAL, D.Sc., F.I.C.

(FELLOW.)

IN opening the discussion on disinfection in its medical, chemical, and bacteriological aspects, I cannot do better than very briefly summarise the more recent work on the subject. I have the more pleasure in doing this, and I think you will have more interest, on account of the decided advances that have been made during the last few years in our knowledge of disinfection, of the preparation of disinfectants, and of the proper modes of testing them. However, there are still many points requiring further investigation, and these I shall have to indicate.

Firstly, as to disinfection itself, the growth of knowledge in the public has to a certain extent eliminated the old idea that it solely consisted in removing smells or disguising them by other odours. An examination of the various disinfectants placed in the hands of our sanitary authorities shows that the majority are several times more potent than carbolic acid, on which formerly such great reliance was placed. Similarly with disinfecting appliances great advances have been made. Dependence is not now so largely placed on aërial disinfection (the air-borne theory being to a large extent exploded); but it is combined with other methods, such as spraying and the removal of infected material as far as possible; in fact, in certain cases the necessity of destruction or steam disinfection of clothes, etc., has been generally recognised; and in place of the disinfection being either inefficient or equivalent to destruction, steam disinfectors can now be obtained which insure not only safe and adequate heating, but also the complete displacement of the air, which is such an essential factor.

The fallacy of attempting to arrive at or control the germicidal efficiency of disinfectants from chemical analyses has often been pointed out, but on the other hand the hopeless divergency of bacteriological tests was not helpful. The desirability of standardising the test culture in

every experiment was emphasized in 1896 by Pearmain and Moor (Applied Bacteriology, p. 288): "In order, therefore, to obtain some trustworthy datum as to the action of a disinfectant upon a given species of organism, it is desirable at the same time as observations are made upon the disinfectant under examination, to determine the strength and time of exposure required for the disinfection of the particular race on which the examination is conducted when subjected to other common disinfectants." For this purpose they cited mercuric chloride and carbolic acid. In conjunction with Mr. Ainslie Walker, during 1903, I suggested a method (the carbolic acid coefficient test) as an outline for the standardisation of disinfectants, so that by adopting strict uniformity of procedure and the insertion of carbolic acid as a control in every test, comparable results could be obtained by different observers; and, as the object of considerable discussion, this has happily helped to draw attention to the increasing necessity for some standard bacteriological method for the legal control of the commercial disinfectants.

This test has been taken as the basis for disinfectant tender forms by a considerable number of authorities, and the Board of Agriculture in their Disinfection Order (dated April 5th, 1906) now permit the employment of preparations equal in disinfective efficiency to a five per cent. solution of carbolic acid. It has been alleged that the Privy Council Order of July 27th, 1900, permitting the sale without trial of fluids containing less than three per cent. of carbolic acid or its homologues, on the ground that such fluids are not poisons within the meaning of the Pharmacy Act, 1868, has resulted in flooding the market with useless disinfectant preparations. On June 4th this year the question was asked in Parliament as to the necessity for action being taken to insure the standardisation of disinfectants.

So as to approach as closely as possible the conditions obtained in actual practice, the introduction of a quantity of organic matter into a standard method has been suggested, and recently a number of papers have been published dealing with the results obtained under these conditions. Kenwood, in collaboration with Hewlett, and also Firth and Macfadyen, employed an emulsion of fresh urine and fæces. The effects of the solutions of definite organic substances such as gelatin, casein, peptone, mucin, serum, and also blood and urine have been investigated by Sommerville and Walker. Wynter Blyth, during 1903, in reporting to a committee of this Institute, alluded to the influence on disinfectants of the phenol class through the presence of even small quantities of organic material, and later (*Analyst*, May, 1906) he suggested milk as a suitable

organic material for testing purposes, as an easily procured fluid containing a variety of organic and mineral constituents in natural proportions. In a paper read before the Chemical Society in December last he compared the figures obtained by fæces and milk, and claimed that by employing a mixture of whole and separated milk so as to adjust the amount of the fat present, similar curves of results could be obtained.

The complex question of disinfection in the presence of quantities of organic substances may be viewed from many standpoints, and there is again the danger of confusion caused by the multiplicity of results obtained by many investigators working under entirely different conditions. Fæces are perhaps one of the most variable of organic products, and, as pointed out elsewhere, it is doubtful if the results obtained for example by Wynter Blyth could be duplicated by himself, not to mention other observers. More distinction should be made between organic matter in suspension and that in solution; sterilisation by means of chemicals can be brought about with certainty in the presence of *dissolved* organic matter, but this is not practical with germs protected by being embedded in masses of solids, until the latter are disintegrated. The sterilisation of fæces, for example, is rarely undertaken in actual practice, and after all, beyond temporarily guarding against the spread of infection during transit, such material is better left to its natural disintegration by hydrolysis in the sewage.

It will always be imperative to know for what particular purpose or purposes a disinfectant is required in order to arrive at its proper ultimate valuation, and there can be no doubt that the preparation should be scientifically tested under conditions resembling as closely as possible those that will be present during its application; but it is hopeless attempting to evolve any one single routine test that could apply to the very divergent circumstances obtaining in every-day disinfection; one that would apply equally to the disinfection of a swimming-bath, to the cleansing of cattle trucks, and to the sterilization of surgical instruments. Reaction alone, whether acid or alkaline, plays an important part in disinfection, and some preparations, depending upon a fine emulsion for their germicidal value, are considerably modified by traces of acidity. However, if a preparation that is stated in certain dilutions to destroy disease germs does not kill under the more simple conditions as those of the carbolic acid coefficient test, it is worse than useless for any disinfectant purposes, and as a fraud its sale should be prohibited. It would be wrong to illegalise certain powerful germicides because they are rendered uncertain in their action by large quantities of organic matter, and it is surprising to find in a

paper published this year such a miscellaneous list as preparations of "permanganate of potassium, eucalyptus, thymol, boric acid, chloride of lime," generally condemned as being "erroneously believed by the public to be disinfectants."

Certain oxidizing agents, such as chlorine, which attack organic matter, are not necessarily rendered ineffectual by an excess of organic material, as I have shown when disinfecting sewage effluents with electrolytic chlorine at Guildford; the pathogenic organisms were killed, although there was sufficient organic matter present to completely remove in a few hours all the free or available chlorine added; and provided that the reagent is added in excess of that almost immediately taken up by powerful and rapidly reducing substances, such as sulphuretted hydrogen, that may be present, the majority of the bacteria are destroyed.

It is singular that the question of time in a standard bacteriological test has not met with more attention, as although, given sufficient time, many chemicals will destroy bacteria, a limit of fifteen minutes throws out some well-recognised germicides; as an instance soap, which does not give any carbolic coefficient, and yet has marked germicidal properties, and perhaps would with advantage displace a few disinfectant preparations which have been put on the market. Many of our most reliable disinfectant substances are unfortunately incompatible with soap, and in ignorant hands this causes great waste. Disinfection cannot replace care and cleanliness, but is at times a necessary auxiliary to them. The very act of cleaning with soap and water is in itself a form of disinfection; but occasionally more active measures are required, and when there is danger of personal infection the whole procedure should be under proper scientific control. Where there is much organic dirt it should first be removed with precaution and cremated; by doing this the greatest economy and efficiency in the subsequent disinfection is secured. Indiscriminate scattering of costly disinfectants on masses of filth is useless and wasteful.

The necessity for the power of penetration is a factor which cannot be overlooked in a disinfectant, but it is reasonable *first of all* to inquire whether the preparation will destroy the germ when it reaches it. By reason of the complexity of the subject, no satisfactory routine test has yet been devised to measure penetration.

The high germicidal values given to certain substances, notably salts of mercury, by earlier observers have been considerably modified recently. Previous fallacious results were mainly due to the carrying over of traces of the powerful germicides into the sub-cultures, the great difference between an antiseptic and a disinfectant dose not always being allowed

for. This difficulty, which also arises in using resistant spores as test organisms, can be overcome in the case of simple chemicals, such as metallic salts, by the addition of suitable precipitants to the cultures, but the traces of the more complex phenol derivatives cannot be so certainly removed.

Dr. Arthur E. Moore (Cork) said he insisted on the necessity of a bacteriological test for disinfectants; for even though the conditions of the test were artificial, it was evident that if a disinfectant failed to destroy micro-organisms when in intimate contact with them, it could not have had a high germicidal value under natural conditions. The time test was not sufficient, as that might vary with temperature, etc., and therefore it was necessary to control each experiment by testing with some standard solution, such as 1 per cent. carbolic acid, and so expressing the germicidal value of the disinfectant in terms of that standard. Such a method led to uniformity of results, and provided a ready method of ascertaining whether a disinfectant was up to sample. The objection to these test-tube experiments was that the conditions under which they were performed were artificial; but it would be impossible to reproduce in any one test the varying conditions found naturally where the organisms were protected by solid matter, mucus, etc. Still something was gained by the knowledge that a disinfectant would rapidly destroy micro-organisms when they came in contact with them.

Dr. Philip Boobbyer (Nottingham), who was unable to be present, sent a note stating that he entered his name as a speaker in the present discussion, mainly with the view of protesting against the specious advertisements concerning various antiseptic and disinfecting agents, which one meets with on all hands at the present time. These advertisements are often misleading, for they commonly refer only to the potential capacity of particular preparations under conditions entirely favourable to their operation, and make no mention of incompatibles and other disqualifying agencies which are of frequent occurrence in practice, and may render the alleged antiseptic or disinfectant entirely inert.

A large proportion of the medical profession and the public take no heed of incompatibles or other like causes of ineffectiveness, and the result of their efforts at disinfection under such circumstances is therefore often entirely negative.

Dr. S. G. Moore (Huddersfield) gave amusing instances of the way in which he was besieged in his office by gentlemen trying to sell disinfectants, most of them consisting of more or less highly refined waste gas liquor. The public used the disinfectants handed out, *but they did not disinfect.* Ordinary soap would in most cases be better without the disinfectant, because it would be purer and not adulterated. These disinfectants were actually injurious, because they lulled

people into a false security. Ordinary daylight and, *in excelsis*, bright sunlight was the best disinfectant. Next was oxygen, and 29 per cent. of the atmosphere consisted of this disinfectant, so that flushing a room with fresh air gave enough of it. Next was heat, now used in the form of steam. Last, and best of all, was "common or garden" soft soap and water, not disinfectant soap. With these disinfection was completely and regularly carried out, no matter how virulent or dangerous the disease might be.

MAJOR C. R. ELLIOTT, R.A.M.C. (who attended as a delegate from the War Office), said the War Office had disinfecting apparatus at Dublin, Belfast, Cork, and the Curragh, and the working of these was controlled and tested by bacteriological work in the laboratory. The War Office was still looking for an absolutely efficient and simple disinfectant, which would be available under various circumstances.

DR. DAVID SOMMERVILLE (London) said that, as a worker for the past four years on this subject, he wished to draw attention to a few points which he considered of importance in connection with the practical details of the Rideal-Walker method of standardisation of disinfectants, and of the modification of this method which Walker and he (Dr. Sommerville) had published. In the original method, described in the Journal of the Sanitary Institute, Vol. XXIV., Part III., 1903, three of the eight factors discussed by Rideal and Walker refer to characters of the micro-organism used, viz., age of culture, variations in vital resistance of same species, and variations in vital resistance of different species; and it was obvious that lack of uniformity in any of these in two consecutive tests must lead to very divergent results. In this connection Walker and he found that great care was necessary in the preparation of the broth in which the standard organism was grown, and that an organism was produced which gave absolutely uniform results when the broth was prepared according to the formula which they published in "Public Health," March, 1906. Without such standard organism the test was useless. Where strict uniformity existed in the physical and chemical conditions of the several materials used in the test, harmonious curves could always be obtained; and these curves—despite what had been said to the contrary—were the index of accurate performance of the test. What adverse criticism had been directed against this test had emanated from those who, through neglect to provide uniform working conditions, had failed to obtain the above curves. With an impetuosity characteristic of insufficient experience of the working details of the method, some experimenters jumped to the conclusion that because it did not include certain forms of complex organic matters, such as fæces, etc., it was worthless. Here it was necessary to emphasise the fact that it was impossible to obtain morbid secretions and excretions uniform in composition and characters, and thus suitable for introduction into a standard test. However, by working with physiological bodies such as mucin, gelatine,

normal blood serum, etc., singly, and in combination, much may be learnt concerning the action of such types of organic matter on different disinfectants. Some results which Walker and he had obtained, on these lines, would be found in the "Sanitary Record," Nov. 29th, 1906, and May 9th, 1907. It was further necessary to emphasise the statement that in attempting an estimation of values, the ability of a liquid disinfectant to kill bacteria rapidly must be considered apart from its powers of penetration of solid masses of organic matter. They could not at present claim more for the Sommerville-Walker modification than that it indicated the relative efficiency of disinfectants in *contact* with *solutions* of standard forms of organic matter; and that leads to the recommendation originally made by Defries, that in the disinfection of masses of organic matter, such quantities of disinfectants should be used as will provide for as large a factor of safety as possible.

Prof. E. J. McWeeney (Dublin) said that in his opinion the most valuable disinfecting agencies were those which Nature supplied, such as sunlight, heat, and the antagonistic effects of putrefactive and fermentative processes on pathogenic organisms. Much of the work done by municipalities in the way of disinfection stood badly in need of bacteriological control. This was especially the case with room disinfection by formalin vapour and sublimate spraying. He confessed himself somewhat sceptical as to the real value of these procedures, at any rate, as usually carried out. He would be glad to know from those present who might have special experience the methods found most efficient for the disinfection of rooms vacated by consumptives. Personally he favoured thorough mechanical cleansing of walls, floors, and ceilings; the removal of every particle of dust by moist methods; thorough aëration and limewashing of the scraped walls, rather than the lavishing of costly disinfectants.

Dr. R. E. Matheson (Registrar-General for Ireland) spoke of the close relation between the decrease of temperature and increase of mortality from diseases of the respiratory organs. He also referred to earth temperature in connection with diarrhœal diseases. Regarding the question of disinfection, he remarked that in a previous census there were several cases of smallpox among the officials, and they feared that infection had been carried by the census papers from houses where there was disease. On the occasion of the last two censuses they had all suspicious papers placed in separate envelopes and subjected to heat, and they had not a case of infectious disease among the officials.

Dr. W. Butler also took part in the discussion.

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SECOND INTERNATIONAL CONGRESS ON SCHOOL HYGIENE,

LONDON, August 5th to 10th, 1907.

IN every civilized country the attention paid to all questions of hygiene has greatly increased during the last few years, and it has been more than ever recognised that the foundation of good citizenship can only be laid in healthy infancy and school life.

It has become generally admitted that scientific methods must be carefully followed out in schools, especially in teaching younger children; brains must not be overtaxed, weak frames must be strengthened by systematic bodily training, and the successful development of the race ensured by attention to the health of its children, especially during their school life.

In order that these aims may be facilitated and advanced by united effort, an International Committee has been formed to hold triennial Congresses on School Hygiene.

The first Congress was held in Nuremberg in 1904, and at this meeting the committee accepted an invitation from The Sanitary Institute to hold the next meeting in London in 1907. The Institute promised to give assistance in the organisation of the meeting, and held a preliminary conference on the subject in February, 1905.*

The International meeting was held this year on August 5th to 10th in the University of London and other buildings, South Kensington.

It was formally opened by Lord Crewe, who brought down a message of welcome from His Majesty the King.

The meeting consisted of members officially delegated by various

* The proceedings are reported in the Journal, Vol. XXVI., pages 1 to 190.

authorities and societies in England, and official representatives of the Governments of most of the Continental and other nations.

Seventeen hundred members were present, one-third of these being visitors from other countries.

The Exhibition held in connection with the Congress was arranged by The Royal Sanitary Institute, and has already been reported in the Journal.*

At the close of the meetings several additions were made to the permanent International Committee for working the Congress, and in addition a permanent Council of School Hygiene was appointed as a committee of reference on all matters that might arise in the subject of School Hygiene between the periods of the various Congresses.

The work of the Congress was divided into eleven sections† and four set discussions; fifty meetings were held during the week and two hundred and fifty papers read, showing the wide scope that is given to the subject of School Hygiene and the interest taken in its various phases.

It is only possible within the limits of this Journal to make short reference to the papers read, and those subjects have been selected that are most likely to be of interest to the members of the Institute. A much fuller report will be published later on in the Transactions of the Congress.

The references have been grouped under the following headings instead of under the eleven sections into which the work of the Congress was divided:—

General Questions—Education and Instruction in Hygiene—Physical Training—Medical Inspection and Supervision—Ill health and Disease in School—School Buildings and Equipment.

GENERAL QUESTIONS.

With regard to the hygiene side of the children's lives (that is to say, the methods of prevention of ill health arising from the necessary confinement and restrictions belonging to civilised life) the problems of physical culture and mental fatigue were among the most important.

Sir Lauder Brunton opened the question in his inaugural address by saying that—

"We are now awakening to the necessity of attending to the body if the mind is to be developed, and many efforts are being made in various

* Vol. XXVIII., Supp., p. 117.

† A list of the sections and officers is given in the Journal, Vol. XXVIII., Supp., p. 95.

countries to secure a system of mental and physical training which will ensure the best development of children.

"One of the most difficult and yet one of the most important questions of school hygiene is how to combine educational work with physical training so that both shall be productive of benefit, and not of injury, to the child. Proper alternation of mental and physical exercise is one means of preventing this, but attention must also be paid to the nature of the physical exercise. The movements of drill at the word of command, and the performance of new and unaccustomed muscular actions involve considerable mental, as well as bodily fatigue, and must not be looked upon as relaxation. Marching or dancing to music after the steps have already been learned, and regular play, such as games of ball, tend, on the contrary, to remove mental fatigue and to develop the body.

"One of the most useful stimulants to the circulation and nutrition, both of children and grown-up people, is pleasure, and anything that adds to it helps to develop both mind and body."

And these views as to physical exercise were enforced by DR. BURGERSTEIN in his address on School Work.

"There is no subject in which scientific research has given such clear results as in corporal exercise, recommended often in older literature, especially drill as a recreation from mental work. Experiments with different methods have shown that corporal exercise is also immediately followed by a diminution of aptitude for mental work. On the other hand, it is to be expected that the increased change of matter going on also is only moderate, more automatic open-air corporal movement—such as walking through some minutes—may have good influence on mental work done afterwards. I could deduce an interesting proof for such questions out of certain figures Teljatnik gives from his experiments." *

He dealt with mental fatigue from the points of view of length and sequence of lessons, the pauses between lessons, and the influence of the seasons.

As to length of lessons he states that, "six-year-old children should not sit in school earnestly occupied with work through more than half an hour without any exercise and rest following; children in infant and junior classes not occupied with near-seeing, half an hour; writing exercise should be interrupted every five or ten minutes by some rest in a comfortable position, and some corporal movement in the desk; also for higher standards non-interrupted writing would better not last longer

* See L. Burgerstein und A. Netolitzky, "Handbuch der Schulhygiene," Jena, G. Fisher, 2nd Edition, 1902, in the part of "Hygiene and Instruction," pp. 454–714.

than half an hour; young people in colleges would better not sit longer than forty minutes in succession. Also continual singing or corporal drill should not last longer before puberty.

"Experienced men have indeed for a long time asked for shorter lessons than have been customary hitherto. Generally known are Chadwick's results, often quoted; but I never could get a description of details of his investigation.

"Regarding the question of mind, we know so far that for getting the best possible results of exercise, this is not to be continued in fatigue, work being then of no value for getting skill. At the Congress mentioned before, I interceded for lessons not lasting longer than three-quarters of an hour: at least in high schools and for pupils under the age of puberty, and for rest after every lesson.

"As to the mere bodily side of the question, every teacher knows how quickly sound positions in best school desks and with best lighting are given up, the muscles of neck and back growing fatigued. Statistics of myopia and scoliosis speak a clear language. Circulation of blood and respiration are influenced in a bad way, serious mental occupation making by itself respiration flatter and slower, and the influence of such work and sitting growing worse in school by the vitiation of air and the difficulty of sufficient artificial ventilation.

"Speaking in general, the first lessons of a day should last longer, from a hygienic point of view, than the later ones. In practice such arrangements are often not to be reached.

"Children sound in body and mind are always occupied when they do not sleep, but there is difference between this occupation and schoolwork, perhaps often too great a one."

Dr. Burgerstein recognises freedom for the children between lessons. He says:

"Further, there must be rests between the lessons, and for using the rests, halls and open-air places to be reached quickly enough, no four-storied buildings with nothing else of free space but small corridors. In the time of the short rest the sound children should have full freedom, except permission to study or sit, and it should not be allowed to shorten or withdraw rests for the purpose of instruction or for punishment."

And, as to the sequence of lessons, he is convinced that the aptitude for mental work decreases in the later lessons, and those requiring intense mental effort, or requiring memory work, would be given best in the first morning hours; lessons wanting good light, such as writing, reading,

drawing, needlework, at broad daylight; that lessons in writing, drawing, or needlework should not follow a lesson of corporal exercise, having fatigued the muscles of the arms; that two lessons needing difficult mental work or two requiring exact near seeing should not follow one after the other; especially reading when first learning, also the first reading of foreign types and of cyphers generally; writing is especially critical because the head must always be somewhat inclined, the rectus superior and inferior alone not being able to move the eyeball down in a sufficient way, and therefore bad positions easily follow.

As to the influence of seasons he finds that bodily resistance and development is indeed influenced by climatological and meteorological factors.

"Growth seems to go on in our climate in the seasons with more light and warmth more energetically than in the dark, cold time. Exact data will be difficult to be got in the countries with highly developed schooling, because nearly all children go to school there, and school holidays generally being in the season of long days, so that comparison of children living under school influence and others cannot be made in such countries. Another question would be, if more sleep in winter-time than in summer is not a natural want. I suppose that morbidity increases generally in central European climates from autumn through winter-time till spring, and goes down in the greater part of spring and whole summer; I don't mean by that especially infectious diseases, but generally diminished resistance against unwholesome influences.

"In the middle ages hard pressure of children learning in schools seems to have been often a principle of education; lack of consideration as to what is wanted for a healthy education is till now merely a consequence of the older ideas in more than one country, and through long years full hours of lessons, long rows of lessons without rest, want of regard to seasons, were a general feature in public education. In more recent times hygiene becomes gradually more and more respected, but the tendency of our time is also to gain in youth the most knowledge possible. So it becomes necessary to have more scientific inquiry and practical observation as to what would be the best; questions arise, but we are not far enough advanced to answer all in a manner free of objection."

DR. BURNHAM's paper, read by Dr. Gulick, endorses these views, and strengthens the conclusion by recording other investigations that have been made in the medical world. With regard to toxic products of fatigue, he thinks that "the whole problem of fatigue is thus an infinitely

complex one. With our present knowledge, it is impossible to give any adequate solution of the practical questions involved. One general point, however, is emphasized by the results of these investigations. Immunity to the toxic products of fatigue is brought about by general habituation to small doses of fatigue toxin. Large doses decrease the ability to work and may do permanent injury. Thus it would seem that the general rule of hygiene is established in correspondence with that resulting from ordinary observation, that the way to develop power to resist fatigue in children is by short periods of intense work followed by periods of rest, and that, on the other hand, prolonged periods of work should be looked upon with grave suspicion as likely permanently to injure the ability to work.

"We do not know the optimum length of lessons for children at different ages, but until further investigations have been made the following maxima seem to be wise:—

"The recitation period should not amount to more than fifteen to twenty minutes for children of the age of six to nine; twenty-five to thirty minutes for children from nine to twelve; thirty-five to forty minutes for children from twelve to fourteen; and forty to forty-five minutes for older children, with recesses of from five to fifteen minutes following. The length of the period, however, should in part be determined by the sequence of subjects.

"While there may be doubt about the reliability of the methods employed, the results of studies by Griesbach, Vannod, and others, agree with observation in placing mathematics and the ancient languages among the most difficult subjects, and drawing among the easy ones.

"Sakaki, who has studied this subject with great care in case of a large number of students, finds that in the elementary schools arithmetic, reading, and dictation are the most fatiguing subjects, and that drawing does not cause appreciable fatigue, and physics and natural history may even be means of recreation. In the higher girls' schools also arithmetic and languages are among the most difficult subjects, while singing and drawing do not cause appreciable fatigue, and knitting and writing serve as recreation.

"The evidence indicates that the custom adopted in many schools of placing mathematics and languages in the morning hours, and gymnastics, drawing, and the like in the afternoon is a wise one."

Dr. Leslie Mackenzie finds that the most important problem of the school is the problem of fatigue, which he describes as being due to causes not all directly hygienic, but some educational. The scope of school

hygiene, however, compels it to deal with matters educational as well as sanitary in promoting the mental and physical health of the child.

SIR JAMES CRICHTON BROWNE, in his address to the first section, said that—

"The tendency of education in the past has been towards the study of books and words rather than of things, and its basis has been discipline and not health. It has been mainly literary or humanistic to the neglect of the study of matter and phenomena. It has concentrated its attention on the mind and ignored the body.

"This Congress is an emphatic assertion of the claims of the body in relation to education and of health as the only safe foundation of good citizenship. It interprets hygiene in a wide sense, and includes in it, not merely sanitary precautions, but all the conditions of human welfare, of intellectual activity, and moral stamina, as well as of somatic soundness and vigour. The inhabitant, as well as the framework, is to engage its attention, and it seeks, therefore, the co-operation of teachers of all classes."

Hygiene of Mind in Education, by T. S. CLOUSTON, M.D., F.R.C.P., Edinburgh.

What is Hygiene? A means to strengthen the defences of the body. A hygiene of mind is possible, and specially applicable in the educative period of life. Teachers should know the correlation of mind and body, and education should be regarded as mental hygienics. Education should strengthen the qualities that make for adaptability to environment; heredity is all-important. Co-ordination of mind and muscle the first ideal and inhibition the greatest faculty to be developed. The individualism of minds must be respected in education.

Child Nature and Routine, by MISS W. HOSKYNS-ABRAHALL, M.A., Bristol.

School education is based upon routine. Daily routine in connection with personal habits is the only routine which can be regarded as good for young children. School routine is a hindrance to the development, and requires to be radically reformed. This might be done without delay. Thus: bookwork should be postponed till after eight years of age; objective teaching adopted wherever possible; life histories of all objects used should be first taught. No drill should be allowed before ten. The size of classes should be reduced. In infant schools and rooms used by children under ten, desks should be abolished and the children should sit on the floor. There should be no time-tables in infant schools, and a frequent interchange of teachers.

Some Synthetic Results of my Paedological Investigations in Antwerp during the years 1896–1906, by DR. M. C. SCHUYTEN.

Antwerp has a complete medical and dental service in the schools, school-baths, and a paedological laboratory.

From drawings of "a little man" on a uniform-sized white surface by children of different ages, there is a regular increase of the length and breadth of the figure drawn from 3½ to 6 years of age, then at the age of entering school, there is roughly a 40 per cent. reduction in the dimensions, which again increase with age. Schmidt Monnard noted actual slacking in child's own development at this age.

In measuring the handgrasp regularly, there is a depression corresponding to the month of March. Eliminating the growth factor, there is a regular seasonal variation in muscular strength, decrease being notable in the summer holiday.

Regular variation has also been noted in attention, apparently inverse to seasonable temperature. Aesthesiometric measurements have definite value.

LOWER LIMIT OF AGE FOR SCHOOL ATTENDANCE.

SIR SHIRLEY MURPHY, in his opening address to Section VII., referred to this subject, stating—

"That attendance at school should be compulsory is inevitable under the conditions of our civilisation. That this attendance involves increased risk of exposure to infection is undoubted, hence the duty of the State to protect the child from risks incidental to an act of enforced obedience is a moral obligation.

"In view of the special incidence of infectious disease upon children in the first few years of life, the question of the age at which these children should be required to attend school is a subject well deserving of study. In England the age of compulsory attendance is five years, in Germany it is one year later.

"Under all circumstances, we may bear in mind that if the age of attack is deferred, it results in a lessening of the fatality of the disease, and that, if postponement of age of attendance at school leads to postponement of age of attack, the result will be a saving of child-life."

The Lower Limit of Age for School Attendance, by ARTHUR NEWSHOLME, M.D., F.R.C.P., Medical Officer of Health, Brighton, Author of "School Hygiene."

The author urged in 1902 that school attendance should be prohibited below five years of age. The increased local financial burden caused by the Education Act of 1902 has further emphasised the subject. The Education Code of 1905 has given complete liberty to local authorities in the matter. Ten

per cent. of English elementary school children are below five. The cost of this is over £1,750,000. The Board of Education Reports suggest that there is no educational advantage in such schooling, and the paper urges in detail the evils of foul air and communicable diseases.

An Investigation into Hours of Sleep among English School Children, by MISS ALICE RAVENHILL, F.R.San.I., London.

Recent discussions have led Miss Ravenhill to inquire into the hours of sleep among children. This was done by sending out 10,000 forms of questions, of which 8,650 were returned and analysed by her.

There is widespread ignorance as to sleep requirements for children. Analyses of the returns tabulated show—

1. The percentage of sleep grows less (from 50 per cent. to 30 per cent.) in both sexes from four to seventeen years of age.
2. Girls have more sleep than boys, but neither have sufficient.
3. The variation is greater among girls; both sexes have more in winter.

Sleep is affected by housing conditions and by home employment. The range of occupations for children is almost incredible. Finally, deficiency of sleep is a potent factor in malnutrition.

The Relation of School Work to Healthy-Mindedness, by PROF. JAMES SULLY, M.A., London.

Synthesis of older and newer conceptions of education.

Healthiness of mind defined. Healthiness of mind not the uniform result of school-training. Work of parent or teacher in promoting healthy-mindedness. The school has never been able to do its best. Improvement of school methods needed. Extension of school influence (*i.e.*, encroachment upon home) inevitable.

The Present Necessity for Attention to the General and Special Hygiene of the Blind, by REV. ST. CLARE HILL, Principal, School for the Blind, Leatherhead.

Hygiene, the knowledge of which is becoming so general, with such happy results, has hitherto been neglected among the blind, who are even more in need of it than the sighted. The general education they now get has prepared the way for hygiene. Absence of light and ventilation common. Want of exercise and training in breathing and deportment, the necessity for cleanliness, and for raising the ideal of a healthy life among the blind.

The Diet in Residential Schools, by EDMUND CAUTLEY, M.D., F.R.C.P., Physician, Belgrave Hospital for Children.

The subject considered on the following lines:—First, the necessity for food; Secondly, quantity, quality, variety; Thirdly, the importance of sys-

tematic supervision and distribution, and of the proper preparation of meals; Fourthly, the arrangement of mealtimes throughout the day and the consideration of the management of each meal; Fifthly, reference to the various articles of diet and a consideration of the necessity for alcoholic drinks; Sixthly, the kinds of food which are unnecessary or even injurious; Seventhly, the diet of delicate boys and of those in training, and the importance to be attached to the refusal of food as a sign of illness or that the diet is unsatisfactory.

Feasible Reforms in School Diet, by EUSTACE MILES, M.A., London.

Suggestions based on experiments:—

No violent revolution urged, but comparatively small changes:—

1. To minimise the amount of wet starchy foods.
2. To add to the amount of fresh fruit, especially in the summer.
3. To give more salads, properly cooked vegetables, and vegetable soups.
4. To give unfermented herb beers, etc.
5. To offer less flesh food, provided that proper proteid substitutes be put in its place to build the growing body and repair its waste.

The mistakes of haphazard Vegetarianism are not to be taken as representative of a rational fleshless diet.

An easy beginning of the change:—6. That every boy or girl should be taught sensible cookery, not cookery of the ordinary type, which is wasteful.

These changes could be added to suggestions made by others at this Congress.

Physicians and Pedagogues in the Schools of To-morrow, by V. H. FRIEDEL, Ph.H., LL.D., Délégué du Musée Pédagogique (Ministre de l'Instruction public), Paris.

Public kindergartens are a hygienic necessity for any rational elementary school system. Medical supervision of the children should begin there, as it is easier and more likely to prove successful. Compulsory elementary schools should be common for all children; the hygienic conditions of the schools would be improved thereby and the systematic selection of the children as to general health, hygienic habits, and educational attainments would be an important result. The instruction in elementary and secondary schools should be coordinated, and there should be greater correlation in the teaching of all subjects; in this way, there will be a possibility of adopting rational and comprehensive time-tables and programmes without the danger of overworking pupils or teachers. Methods of public instruction must be modified in order to harmonise with modern ideas of physical, mental, and moral development, which are the outcome of co-operation of pedagogues and school physicians.

EDUCATION IN HYGIENE—FOR TEACHERS.

Education in Hygiene for Teachers, by DAVID SOMMERVILLE, M.D., M.R.C.P., Lecturer in Public Health, King's College, London.

Education is the adjustment, during its plastic period, of the organism to its environment.

By the light of evolution the paths of the educator are made clear. This light is necessary for all who would tread these roads, hence the candidate should know many things which to-day find no place in his training. The broad principles of biology, an intimate acquaintance with human physiology.

Hygiene and Physiology for Teachers, by A. BROWN RITCHIE, M.D., Medical Officer, Manchester Education Committee.

What facilities exist at present for teachers to acquire a knowledge of hygiene and physiology.

The amount of knowledge required, and the methods for acquiring it.

The teacher requires this knowledge—(1) to assist school doctor in medically supervising his school, and (2) for imparting such knowledge to his pupils.

Special lectures should be given to teachers dealing with special subjects, such as mentally backward, epileptic, and badly nourished children, and by nurses to elder girls on hygiene of babyhood.

At Manchester twelve lectures given to pupil teachers in second year; four special lectures to teachers on the work of a school doctor; popular addresses to parents, and addresses by nurses to elder girls.

A good teacher with good knowledge of hygiene will greatly increase amount of useful work of the medical officer in school; in fact, co-operation between teacher and medical officer will bring about more good than many school doctors can do independently.

In Manchester knowledge of hygiene acquired by teachers already bearing fruit; the medical officer depends on them for a report on any cases that require his attention.

The Practical Training of Teachers in School Hygiene, by PROF. CARSTAIRS C. DOUGLAS, M.D., D.Sc., F.R.C.S.E., Anderson's College, Glasgow.

The courses in school hygiene devised for teachers usually err in excess either of anatomy or physiology, or in hygiene. All this should be cut down to practical consideration of the effects of school life on the child. There should also be definite practical work. The various points treated in the Teachers'

Lectures at Glasgow, and the method of practical demonstrations. The teachers make acquaintance with physical measurements, vision testing, and other observations within their scope.

Some Notes on the Suggestive Training of Teachers in Practical Hygiene, by MAUD CURWEN, Lecturer in Hygiene, Staffordshire C.C.

The ideal set up by Professor Edgar at St. Andrews, of a thorough course of educational hygiene, is described, then descriptions of the work at Cardiff, and the West Riding courses inaugurated by Miss Alice Ravenhill. The work as carried out by Miss Barker for the East Sussex County Council: and, finally, Miss Curwen's own work under the Staffordshire County Council.

The Training of Teachers in Methods of Physical Education, by MME. BERGMANN ÖSTERBERG, Principal of the Physical Training College, Dartford Heath, Kent.

Physical education is the application of physical and hygienic conditions to the development of perfect health. It is necessary both to prevent and to correct bad habits. Anthropometric statistics go to prove that English outdoor games combined with Swedish gymnastics provide the most perfect physical education.

It is the duty of both mother and teacher to appreciate and apply these exercises in accordance to laws of physiology; it would promote body growth, prevent mental overwork, and indirectly build up character.

Teachers should have at least two years' training; they would then be expert teachers for secondary and elementary schools. Only experts should have the care of the physically deformed. The range of knowledge and the method of granting diplomas described.

Account of Continuation Course of Hygiene and Physical Training given in Dunfermline during the Season 1906–1907, by MISS LEILA M. RENDEL, Supt. of Physical Training, Dunfermline.

Object to keep girls at fourteen from going to work, and to teach them to live a healthy and useful life.

The author holds that young girls entering unsuitable employment go to swell the ranks of the unemployable and unemployed.

The basis of the scheme is Physical Training in its widest sense, combined with a training in Domestic Economy.

Duration of course is six months— three to four hours a day for five days, and includes Gymnastics, Swimming, Games, the Laws of Health, First-aid and Sick Nursing, Cooking, Dressmaking, Laundry-work.

THE TEACHING OF HYGIENE IN SCHOOLS.

The Teaching of Hygiene in Primary Schools, by PROF. RICHARD CATON, M.D., F.R.C.P., J.P., Cons. Physician, Liverpool Royal Infirmary.

In view of the decadence and degeneracy manifest in town populations, the modes of life of the people should be reformed, they should be made to understand that by their own mistakes in regard to atmosphere, diet, misuse of alcohol, and in the manner of bringing up children, they bring suffering, weakness, and death upon themselves and their children. These mistakes are in large measure the result of ignorance. Little attempt has as yet been made to instruct the people in the art of living.

Those who are familiar with the lives and homes of the poor, their ailments and the causes of death most common among them, know how largely they are preventable. The people are anxious to do what is best, but they lack knowledge and method.

It is difficult to impart these to illiterate adults who have already formed bad habits. But healthy principles can be taught to the elder children. The subjects dealt with are interesting and familiar. Every school-girl is much interested in the management of infants and small children; much of her time is occupied in attending to them. The experience of the schools in Liverpool in which this kind of teaching is given to girls is encouraging; it is accepted by them with keenness and intelligence.

If this knowledge be impressed on the minds of boys and girls towards the end of their school attendance it would influence their conduct subsequently. The object-lessons they too often witness of the results of alcoholism might be turned to good if they were taught what is the physiological effect of alcohol upon the body. For such teaching to be effective it is necessary that teachers be trained, that regulations to that effect be made by the Education Department, and that such teaching be compulsory.

The Teaching of Physiology and Hygiene in the Council Schools, by JANET CAMPBELL, M.D., M.S.Lond., L.C.C. Medical Staff (Education).

Need for teaching simple physiology and hygiene in the Council Schools, both elementary and secondary.

Particularly important for students intending to become teachers to have some knowledge of these subjects in order that they make take, later on, an intelligent interest in the physical condition of their pupils.

Value of commencing this branch of study early. The scope of the teaching.

Some practical instruction should be given to teachers in the everyday diseases of childhood.

Systematic teaching in the ordinary Laws of Health should do much to raise

the standard of personal cleanliness and physical development in the elementary schools.

Hygiene as a School Subject in Elementary Schools, by HENRY KENWOOD, M.B., D.P.H., Professor of Hygiene, University College, London.

Hygienic habits have to be taught in school. Not necessary to teach the mechanism of respiration in order to inculcate the value of fresh air. The simplest hygienic training aided by frequent informal talks should permeate school life. The home and the parent can often be reached through the school and the child. Open window drill as a practical lesson.

Instruction in Hygiene for Teachers in Secondary Schools, by THOMAS D. WOODS, Prof. Physical Education in Columbia University U.S.A.

Teachers have children under their observation and care during their school life so much more than any one else, that it is of importance they should have a wide knowledge of the hygiene of school and child-life. Not only that they may teach the subject, but for the immensely greater power it gives them of safe-guarding the child's mental and physical development. The wider the teachers' knowledge, the more useful can they be to the children.

The Teaching of Hygiene in Secondary Schools, by C. E. SHELLY, M.D., Medical Officer, Haileybury College.

Hygiene has no existence as a subject of instruction in secondary schools in England (except in some training colleges for teachers, where it is irregular and intermittent). Therefore, although instruction in hygiene is a subject specially recognised in elementary schools, there is inadequate provision for training of teachers and pupils in secondary schools who do not learn it. The reasons for this are the difficulty of finding room in the curriculum, the increased expenditure, and the belief that special instruction is unnecessary owing to the superior social plane from which pupils are drawn. The position is, therefore, illogical; instruction in personal hygiene is admitted to be desirable for the labourer's child, but the teachers themselves are not trained to give it; further, if desirable for one class it is desirable for all.

The difficulties in the way are not insurmountable; but to bring it about its importance must be more fully realised by parents of the educated classes, and its material value as an item of educational equipment must be established.

The Teaching of Hygiene in Secondary Schools, by GEO. FLETCHER, Asst. Secy., Board of Agriculture & Technical Education, Dublin.

Only recently have the claims of hygiene been regarded as entitling it to a place among the subjects of secondary schools.

Our claim now is that hygiene should be an integral part of secondary education for both boys and girls.

The teacher's responsibility is almost as great as the parent's in regard to hygienic knowledge of children. The difficulties all lie with the teacher and training in hygiene.

The subject should not be regarded as an extra, but be assimilated into school life. The claims of professional subjects in boys' schools almost exclude hygiene in the Irish programme.

The Teaching of Hygiene in Secondary Schools, by REV. H. B. GRAY, D.D., Warden, Bradfield College.

Instruction in hygiene is required in youth. Training of body should be combined with explanation of cause and effect; also values of foodstuffs should be taught. Disapproves of long lessons and cramming for scholarships. Teachers should know the connection between mental and physical conditions, and how best to draw out the various dispositions. Emphasises the need of instruction in sexual and natural laws to ensure orderliness of conduct, both moral and physical.

The Teaching of Hygiene in St. Andrews Secondary Schools, by PROF. JOHN EDGAR, M.A.

Doubtful whether there is any direct teaching of hygiene in secondary schools, but the health of the children is by no means neglected.

Residential schools turn out some of the healthiest pupils in the world, the environment, as a rule, being thoroughly good, hygienic living rather than hygienic knowledge being inculcated. Few teachers have any knowledge of hygiene, far less of the psychological principles on which their work should be based. The importance of hygiene, however, should be insisted on, and some method adopted for introducing the teaching into our secondary schools.

If all teachers were instructed in hygiene as part of their professional training, then incidentally in every classroom many valuable hints might be given calculated to deepen the effect of the direct teaching, and show its application to the every-day work and life of the pupils.

THE HEALTH OF TEACHERS.

The Hygiene of School Teachers, by Dr. Duoh Panyrek, Medical Officer of Schools, Prague.

The health of teacher and pupil is mutually correlated. The teacher may act as a carrier of disease from the school to his family, or *vice versâ*.

The importance of the teacher's health chiefly applies to contagious diseases, but is also applicable to mental states or diseases, or to conditions resulting from chronic diseases of digestion.

Prophylaxis can be attained by attention to the school generally.

For other factors statistical enquiries are needed, based on morbidity and mortality rate relating to teachers. These facts can be obtained:

1. From the teacher himself;
2. From his physician;
3. From life assurance returns affecting teachers;

and could be classified by a specially appointed committee.

The treatment of tuberculosis amongst teachers should be a special care of the authorities.

All teachers suffering from phthisis should be invalided to sanatoria on full pay, and not allowed to return to duty until cured; they should then be appointed to more healthy posts in the country.

The Care of the Teacher's Voice, by H. H. Hulbert, M.A., M.R.C.S., Lecturer on Voice Production, London Day Training Colleges.

The teacher the greatest voice-user. A very large percentage suffer from voice trouble through improper use of voice; remedy, voice-production, other hygienic measures insufficient. Physical education, singing, and elocution. The value of position for voice. The control of the breath, different kinds of breathing for different purposes, the hygienic effect of the internal method upon the vocal organs. The abdominal press and its effect upon tone and phrasing. The value of tone in speaking, how it saves the voice and increases its audibility. The effect of sentiment upon the voice and upon delivery; how to convey sentiment. Functional voice troubles and their relief in teachers.

School Overwork as shown by Effect on Teacher, by Margaret McMillan.

Deteriorating effect upon nervous system. Monotony and fatigue. The fatigue not of hard work, but of worry work. Fear and anxiety are symptoms of disorderly working of higher brain centres. Teachers present these symptoms. There should be more economy of working power. The mistaken methods of learning and teaching that induce chronic fatigue must be given up.

PHYSICAL TRAINING.

This section of school hygiene has already been referred to in the introduction as dealt with in the Inaugural Address and some of the general discussions. The president of the section on physical training, SIR JOHN BYERS, in his opening address said:—

"It is well to make young people realise that the use of physical exercises will prepare them all the better for being proficient in games and athletics. Games do not train enough all the muscles of the body, and perhaps do not give the same amount of strength as exercises, yet, on the other hand, games (which on medical grounds must not be compulsory on every boy and girl, and which should be varied, properly selected, and judiciously supervised) do something more than increase bone and muscle and produce strength."

Physical Training for Adolescent Girls, by MRS. MARY SCHARLIEB, M.D., M.S.Lond., Senior Physician for Diseases of Women, Royal Free Hospital, London.

Pupil teachers, the brightest of the elementary school girls, are scarcely fitted by environment or training for the strain of preparation for entrance to training colleges at the age of eighteen.

Information has been collected from twenty-six pupil teacher training centres and analysed by Dr. Scharlieb. Inadequacy of all physical conditions is the most prominent feature.

Uniform and thorough medical inspection, preferably by medical women, a lower standard of work, and longer period of student life, the value of exercises, games, dancing, swimming and so forth should be insisted on.

School Dress for Girls, by MADAME GURLI LINDER.

The ordinary fashion of clothing girls is discussed in all its bearings, and the disadvantages pointed out. Comfortable and becoming garments, few in number, but of the right shape and material are suggested. In Sweden it is customary for schools to keep models and patterns of hygienic garments; these can be copied by the parents to the great advantage of the coming race.

Physical Education, Gymnastics, Games, and Sloyd, by AKSEL MIKKELSEN, Copenhagen.

Practical work should go hand in hand with book work in schools. Educational forms. Sloyd taken from the most universal practical work, carpentry—gymnastics, at first for attack and defence, then for show, now as corrective to education. Games.

The foundation elements of physical education. Types of movement. Drawing, pushing, lifting, striking, etc. Normal and abnormal movements.

Training in fine work dexterity, as compared with the coarser work of gymnastics. The advantages of Sloyd as a neuromuscular education.

The Place and Limitations of Folk-Dancing as an Agency in Physical Training, by DR. L. H. GULICK, Director of Physical Training, Public Schools of New York City.

The immense physiological value of the folk-dances as inspiring a love of physical exercise has been turned to account by utilising the best of the old European dances imported to America. They have been unconsciously developed along the line of neuro-muscular co-ordination, in accordance with true evolution. The dance gives these racially old co-ordinations to the individual. Formal gymnastics have acquired a new interest since these folk-dances have been co-ordinated with physical training. For these reasons we are developing folk-dancing as one of the elements of the physical training schedule in the elementary and high schools of New York City.

The Guild of Play and Residential Vacation Schools, by MRS. C. W. KIMMINS.

The paper deals with the simplicity of the organised play for children as arranged by the Guild of Play at the Bermondsey University Settlement. It treats of the various outcomes of the play, such as a residential vacation school in August, and country holiday work in June, also with the social effect of the play upon the families from which the children are drawn.

Certain suggestions are made as to ways in which the play may be made still more useful by means of hearty co-operation with other societies to prevent overlapping, and by joint effort to attain far better results than many separate organisations can ever achieve.

The Manchester Country School for Town Children, by HENRY L. P. HULBERT, M.D., Asst. Medical Officer, Manchester Educational Authority.

This school was built in 1903, at a cost of £3,000, to accommodate 124 children, with the necessary staff. Children from Manchester elementary schools go for a fortnight's education in the country. Board, lodging, and train fares for the fourteen days cost 11s. 7d.; of this the parents pay 7s. The school is open from April to end of October. Marked physical improvement is noted, and the enforced cleanliness and regular hours are of much educational value.

The Children's Happy Evenings Association, by THE COUNTESS OF JERSEY, President, Children's Happy Evenings Association.

This association, which is entirely voluntary, teaches children how to play. It was started in 1890; the L.C.C. schools are used in the evening for the purpose one evening a week. Games of all kinds, drill, dancing, carpentering, etc., fill up the time. The moral influence of these play centres has been excellent.

School Hygiene in Scotland, by W. LESLIE MACKENZIE, M.A., M.D., Medical Member of Local Government Board, Scotland (with DR. W. K. CHALMERS).

The Royal Commission on Physical Training (Scotland) commissioned Dr. Mackenzie to obtain information by actual examination of 1,200 children. Since then there has been a steady development in Scotland. In Glasgow 80,000 children have been weighed and measured. The Swedish system of physical exercises is now superseding all others. In Edinburgh, Glasgow, Dundee, and Leith, careful surveys have been made of school children. Dr. Chalmers, in a note at the end, summarises the factors which cause inefficiency in the population.

A Record of the Physical Examination of One Thousand Boys at their Entrance on Public School Life, by DR. CLEMENT DUKES.

The paper registers the physical examination of one thousand British boys between the ages of thirteen and fifteen years at their entrance upon English public school life.

The proportions are here expressed as *percentages* of the aggregate cases:—

Height	Above normal	52·2
	Average	11·3
	Below normal	36·5
Weight	Above normal	47·2
	Average	5·7
	Below normal	47·1
Chest Measurement.	Above normal	44·5
	Average	13·2
	Below normal	42·3
	Congenital	1·7
Deformities	Acquired	149·1
Nervous Peculiarities		8·1
Defective Hearing		3·4
Defective Sight		20·8
Teeth	Well-cared for	94·3
	Neglected	5·7
Respiration	Nasal	88·8
	Oral	11·2
Heart Disease		1·0
Chilblains		43·7
Hernia		0·8
Varicocele		9·6
Incontinence of Urine		2·8
Albuminuria		15·7

MEDICAL INSPECTION AND SUPERVISION.

On the matter of school inspection, Sir Lauder Brunton holds that in all attempts to insure the physical welfare of school children, it is necessary that schoolmasters shall work hand-in-hand with the doctor.

Dr. Leslie Mackenzie explains that he considers "the ultimate purpose of medical inspection is, on the one hand, by early examination to protect and fortify the child against all disease and disease-producing conditions; on the other, by taking advantage of the diseases and conditions thus revealed, to improve the hygiene of his total environment. The primary and ultimate purposes must be regarded as part of one programme. They determine for us the nature and extent of the examination. They indicate that we must examine, first, the individual organism; second, his relation to his environment both at home and at school;" and feels that "examinations must be conducted within school conditions—that is, it must be conducted at school, within school hours, during school work, or during intervals of rest. These limitations make it essential that the primary examination shall be strictly practical. By this I mean that it shall be limited to the health conditions that fit or unfit the child for his school work. It ought not to include, except as an incident, details of merely scientific interest—for example, anthropometrical measurements or anthropological observations," and indicates the extent of the examination with regard to homes.

"I do not see how it is possible to separate the personal examination of the child from the examination of his home environment. The child, through all his school work, is affected by the conditions of his home. Infectious diseases, skin diseases, rickets, mal-nutrition in many varieties, all depend in greater or less degree on the conditions of the home, and they all in some degree affect the working capacity. To some extent the improved environment of the school may neutralise the effects of overcrowding, the nervous irratibility and exhaustion due to vermin, uncleanliness, and diminished or disturbed sleep. But I consider that one of the most valuable results of the personal examination of the child is the illumination it throws on the conditions of the home.

"Secondly, the examination must include the condition of the child's inherited faculties as directly affected by his environment. It follows that space should be allowed for the cleanliness of body and clothing, the presence or absence of parasites, mal-nutrition due to insufficient food,

insufficient sleep, or to domestic neglect. These details are all important in any subsequent investigations of fatigue.

"Thirdly, the examination must further include a careful scrutiny of the organs of education, namely, the primary senses of eye and ear; the vital organs, lungs and heart; the respiratory passages, nose and throat; the general muscular condition; the functional condition of the nervous system.

"Whether the examination should be made so comprehensive as I have indicated is a legitimate matter for discussion. But no objection to this comprehensiveness can be taken on the ground that it is not practicable within school conditions."

On the question of administration Dr. Mackenzie speaks strongly:—

"I am not inclined to lay down strict lines of progress in this matter. But one administrative mistake we should do everything possible to avoid, namely, the organising of inspection in such a way that the local authorities will be tempted to offer illusory salaries to part-time officers already in practice, and neglect to appoint some central officer, whose duty it will be to organise and correlate the work. When the Public Health (Scotland) Act of 1867 was passed, the execution of it was placed in the hands of the parochial boards. The result was that medical officers were appointed at salaries of £1, £2 and £3, or other trifling sum, and retained merely as advisers. For twenty years the administration of Public Health in Scotland within the rural areas was a name and nothing more"; and gives as reason "assigning the direction of the work to a special medical officer of schools acting independently of the medical officer of health, but co-operating with him, are the following considerations:—

"1. The medical officer of schools approaches the child for the purpose of fitting it and keeping it fit for education, of preventing injury from school conditions, of exploiting to the full such faculties as it may have.

"2. He is not indifferent to the hygiene of the environment, which always affects the working capacity, and he can always secure the co-operation of the medical officer of health in improving the environment, both at home and at school.

"3. He finds that the most important problem in the school is the problem of fatigue, which is a function of many variables; not all of them directly hygienic, some of them being specifically educational. He maintains that, for the investigation of the conditions of fatigue, the present training and experience of medical officers of health is not of exceptional value.

"4. Though concerned with the child's hygienic environment, he is

not limited in his outlook to the grosser circumstances, named roughly drains and water. He works, not from the environment to the child, but from the child to the environment. He maintains strongly that the personal and detailed examination thus made necessary is the proper sphere of a new specialism."

The Proposed Inspection of Children in Elementary Schools, by J. WILLIS BUND.

The Bills before Parliament will be of no value unless the work is done on a uniform system. In most public schools of England there is no medical inspection. Inspectors must be properly qualified, or they will only bring about failure. It will be better to have no inspection at all than an inefficient, badly-paid staff. The Inspectors should be independent officers of the local education authorities, having charge of not more than 10,000 children, and a salary of not less than £300 a year. Children will attend school with advantage before the age of five if they are under the doctor's eye. Medical inspection does not merely mean dealing with epidemic and isolated cases, but is a system whereby education will mean the development of the body as well as the mind.

Organised Medical Supervision of School Children, by H. MEREDITH RICHARDS, M.D., B.S., Medical Officer of Health and Medical Officer Education Committee, Croydon.

As at present carried out at Croydon has in view ultimately the examination of every school child. The medical officer is assisted by health visitors, who attend at the schools and visit the homes to give advice, and to obtain information. Procedure in schools deals with infectious diseases, verminous conditions, ringworm, and routine medical examination. The first routine examination takes place when child enters school, and is usually superficial, except in selected cases. The subsequent routine examination, which is more searching, takes place when the child enters higher school; abnormalities are discovered, and, if treatment required, the health visitor goes to the home and suggests that the child should be under medical treatment, and herself gives advice on matters of domestic hygiene. Special supervision is carried out every six months and supplementary examinations are held from time to time as to mentally and physically defective children. The medical officer holds a conference with the health visitors and superintendent of attendance officers twice a week. The medical supervision at Croydon is adapted to local conditions. Variations would be necessary in order to adapt this system to the requirements of counties and of rural and smaller urban districts. But as 80 per cent. of school children live in towns the problem is mainly an urban one. Treatment of diseases affecting school life ultimately to be undertaken by State.

Medical Supervision of London County Council Secondary Schools, by JANET CAMPBELL, M.D., M.S., L.C.C. Medical Staff (Education).

Medical supervision of these schools has only been undertaken recently. Most of the pupils intend to become teachers; therefore systematic inspection is necessary to maintain the standard of health at highest possible level, and to eliminate at an early stage those pupils who through physical defects are unfit to become teachers. Every child is examined soon after admission, as to vision, hearing, teeth, general physique and condition of heart, lungs, and spine. Measurements of height, weight, and girth are taken. A permanent record of this examination is kept for future reference. The parents are notified as to defects, of which anæmia (with associated headaches), lateral curvature of the spine and round shoulders are the commonest in the girls' schools. Much may be done to improve the physique by remedial exercises, and the co-operation of the drill mistress in these special classes is essential. It is important to guard against overstrain in the case of delicate children. Games, such as hockey, tennis, and cricket, form an important part of the curriculum, but even then medical supervision is very necessary.

Medical Supervision of Infant Schools, by DR. MARION HUNTER, L.C.C. Medical Staff (Education), London.

Medical inspection and power to compel parents to remedy the ills of their children is the first step to improve the natural physique. We neglect curable conditions in childhood to treat them later in asylums, infirmaries, and hospitals. Compulsory, organised, universal medical inspection needed. School visited once a week. Education of mothers through medical inspection of infant schools. Necessity of dental treatment in school. Experience shows that the medical inspector should never take anything for granted, but should see all and test all. In towns school attendance should not be delayed at the younger ages in the infant schools. Many conditions are in a most remediable stage, notably tubercular bone diseases.

Medical Supervision of Secondary Schools in Sweden, by DR. GOTTFRID JÖRNELL, Medical Inspector of Schools, Hernösand, Sweden.

Secondary schools in Sweden have medical inspectors with well-defined duties. The school building, ventilation, arrangement of work, drill, and any point connected with health of those attending are under his care. He must attend free any poor children requiring treatment. He must attend the drill class once a month. He confers with headmaster and gymnastic teacher whenever required.

Methods of Medical and Hygienic Examination in School, by DR. JANELE, School Physician of the City of Prague (with DR. MOUOKA).

The medical examinations in the schools of Prague are only modified from ordinary clinical examinations to suit school conditions. The various physiological

systems are explored by the usual means. The classification of the general health is difficult. Anthropometrical measurements are useful if systematic. The oral and nasal cavities are explored, condition of teeth noted, vision tested, and hearing to whispered voice all registered carefully.

The Method of Examining Children on Admission to the Public Schools of Leipzig, by DR. THIERSCH, Sanitätsrat.

The school children in Leipzig have been systematically examined at the beginning of their second term after admission. The preliminary examination of vision and hearing by the teachers under medical superintendence. Then detailed examination a little later by the doctor. The parents willingly attend this. The doctor delivers a short preliminary lecture on personal hygiene, then in the presence of mother and teacher each child is completely examined, the teacher taking notes for the health card which belongs to each child, and passes with it from class to class. If defects are found the parents are directed to seek treatment. Subsequent examinations take place at least biennially; more often if defects are found.

The Co-operation of Teacher and Doctor in School, by T. P. SYKES, M.A., Bradford, Ex-President of the National Union of Teachers.

Teachers in elementary schools want the help of the doctor. In Bradford he is necessary, owing to the refusal of the certifying factory surgeons to help to abolish the iniquitous system of half-time child labour in the factories. From this surgeons' decision as to the fitness of any child there is no appeal. Out of 4,000 children who have passed as half-timers from my school in the last twenty years, not one has ever been rejected; even those who cannot see the writing on the blackboard three feet away are admitted to work amongst dangerous machinery, and those not fitted to play in the playground are allowed to work in the factory. With regard to the general question, the doctor should be a reasonable man, with power to do things and to order things to be done. He should remember that the school is not so much a place for enabling the maximum number of children to write and spell, but rather a centre of civilising and refining influences, and we want his help in getting an eye upon the individual child as to physical, mental, and moral development. In Bradford, so far, the doctor has not been able to accomplish much, his hands have been tied.

The Work of the School Nurse, by DR. DUNCAN FORBES, Medical Officer of Health, Cambridge.

A school nurse was appointed in Cambridge in October, 1906, at a salary of £95 annually.

The teachers are provided with printed instructions as to symptoms, etc.,

and supply lists of cases of known or suspected infectious diseases, and the nurse verifies the diagnosis. The medical officer of health takes action on her reports, and when there is doubt visits cases himself. The nurse visits cases weekly, and in some ringworm cases applies ointments as treatment. Before issuing a return certificate the nurse visits the child, and, if necessary, takes material for examination at the Public Health Office.

In certain schools the children with ringworm are allowed to return to school under conditions for which the nurse is responsible. She also tests vision, colour vision, and hearing, and carries out the routine work of medical inspection, thereby greatly economising the time of the medical officer of health.

Medical Treatment at School in its Social, Economic, and Professional Aspects, by JOHN H. CRONIN, M.D., Assistant Chief Medical Inspector, Department of Health, New York City.

About one-sixth of New York's children have had thorough physical examination, but treatment has been confined to a few conditions in about one-third of the 162 schools. The results of this treatment have led the Health Authorities to demand facilities for extending treatment to all conditions of contagious disease. It is advisable that the medical man should be municipalised. There is a close analogy between the State control of transmissible diseases such as small-pox, tuberculosis, etc., and conditions favourable to the spread of contagion. The objections on social grounds are only of theoretical importance; practical experience is in favour of such a scheme. The cost of treatment at school compares favourably with the necessary expenditure involved in securing the treatment of defective children by means of parental responsibility or through voluntary agencies. There is a great economic gain in the work done by efficient wage-earners of sound physique as compared with the inefficiency of the underfed, ill-developed children as industrial agents. The economic gain of recognising the prior claim of public welfare should not be overlooked. Therefore, treatment at school can be justified, not only by results, but also on social, economic, and professional grounds. The treatment of particular conditions should be determined on grounds of expediency.

ILL HEALTH AND DISEASE IN SCHOOL.

The school in relation to tuberculosis was discussed chiefly by DR. NEWSHOLME. He thought that children were probably negligible as a source of infection.

"To what extent are these children a source of infection? Probably very little. Children seldom expectorate; and a child with a troublesome cough would not be kept long in school. It does not appear likely that there is much spread of the infection of tuberculosis from scholar to scholar in schools.

"Teachers and caretakers are possible sources of infection. There do not appear to be trustworthy statistics of the amount of pulmonary tuberculosis in teachers. Probably it is somewhat more than in the general community, and, judging by my own experience, I should say that it is more often laryngeal than in the average of consumptives. The medical examination of teachers and of caretakers, as well as of scholars, is obviously indicated as a precautionary measure"; but he felt that much could be done to prevent schools from provoking latent tuberculosis to activity.

"Overcrowding is the rule in schools. A larger floor-space should be required. Classes are too large, thus straining the voice of the teacher, and making him much more prone to tuberculosis. Ventilation is usually very defective; and the methods of cleansing, involving the raising of dust, need reform. In England the children of the great majority of the population almost certainly do not suffer from over-fatigue due to games; but there is little doubt that many of these suffer from over-fatigue and want of sleep, due to domestic and sometimes to industrial demands, and to defective domestic arrangements. These factors cannot fail to aid in setting ablaze the smouldering fire of latent tuberculosis. In each of these particulars there is much need for detailed medical supervision of our schools and scholars, and for the adoption of preventive measures.

"The medical examination of all children on admission to school and periodically afterwards, supplemented as it must be to attain its full value by information systematically acquired in regard to the health conditions of their homes and all living in them.

"The periodical examination of caretakers and teachers, and the avoidance of excessive strain on the voice of the latter or over-fatigue in general."

The Schoolroom as a Factor in the Production of Tuberculosis, by WILLIAM OLDRIGHT, M.A.

An excessive death-rate from tuberculosis among teachers is shown by mortality returns. Among teachers, especially females, the proportion of deaths from tuberculosis to deaths from all causes is excessive. In some of the tables it is greater proportionately than in any other women's occupation, and as great as that of printers and stonecutters. Causes suggested the excessive vitiation of school air from respiration and defective ventilation. The lamentably small cubic space and low rate of change of air, also, perhaps, chalk dust. Specific cases of improved conditions in newer schools.

A resolution recorded by the Congress on the question of school air would be useful in lessening tuberculosis, headache, lassitude, inattention, etc., due to results of bad air.

On the Incidence of Tuberculosis in Elementary Schools in West London, by DR. J. E. SQUIRE, C.B., Physician to the Mount Vernon Consumption Hospital, L.C.C. Medical Staff (Education); with MISS ANNIE GOWDEY.

A preliminary inquiry was made as to the number of children attending elementary schools, who were supposed by their teachers or parents to be suffering from tuberculosis. Returns of 58,934 children gave ·55 per cent. as supposed to be suffering from pulmonary, and ·44 from other varieties of tubercular disease. These returns were found to be unreliable. In one special district the returns were extended to find the number of children out of school with these causes assigned; they were for 5,679 children 6 per cent. pulmonary and 13 per cent. other varieties of tubercular disease.

On examining all the 1,670 children of two schools, ·47 per cent. showed signs of what might be described as tubercular, ·83 were very doubtful, and 2·8 were non-tubercular diseases of the chest; the tuberculosis being unsuspected in most cases.

Revealed Tuberculosis in Children, by H. C. LECKY, M.B., Res. Med. Officer, Borough Sanatorium, and W. CLAUDE HORTON, M.B., Res. Med. Officer, Children's Hospital, Brighton.

Out of 806 children (591 in an elementary school, 74 in workhouse and infirmary, and 241 in the parochial industrial school) no evidence of tuberculosis was obtained in 571.

Three cases had phthisis, 40 other lung signs, 7 tuberculosis glands, 6 pro-

bably tuberculous, and 169 enlarged; 7 had bone or joint tubercle, and 3 tubercular; 3 skin disorders. These results and compared with English and Scotch examinations and confirmatory evidence adduced to show that there is very little revealed tuberculosis in elementary schools.

The Influence of the School on the Impairing of the Health of School Children, by DR. V. HÜTTEL, Medical Officer of Schools, Prague.

Defective vision and spinal curvature are directly caused by school life. There are many other evils too. School doctors should have power to compel immediate removal of any school condition likely to injure the children. Nervous manifestations, due to overwork, are common in the higher classes. On entering school, any abnormality present in child should be noted by school doctor. Rooms should be warm, airy, and suitably furnished, absolutely clean. Lessons should be so arranged as to avoid strain of mind and body. With care school life should benefit a child in all respects.

Some Points in the Problem of Ill Health and School Attendance, by F. J. POYNTON, M.D., F.R.C.P., Physician to the Children's Hospital.

The importance of an epidemic grant as a national insurance against infectious disease is urged. The danger of sore throat in childhood is pointed out, particularly in its relation to rheumatism. The need for special consideration of the numerous class of rheumatic children, and the value of special schools for the victims of chronic heart, non-tubercular pulmonary, and renal diseases are shown. The treatment of epileptics educationally is discussed, especially the large group neither mild enough for attendance at ordinary school nor severe enough for colonial treatment. The gradual evolution is desiderated of an organisation of convalescent homes in the country and seaside associated with country and seaside schools.

Dr. Poynton emphasised the importance of allowing the epidemic grant as a national insurance against the school diffusion of infectious diseases, and as a means of obtaining a suitable period of convalescence for the children. The danger of sore throats in childhood and the necessity for prompt action by school authorities were commented upon. The frequency and severity of acute rheumatism with its attendant consequences, heart disease and chorea, among children in large towns was insisted upon, and these dangers described with some detail and grouped under four headings. Firstly, there was the nervous temperament of children of rheumatic parentage; secondly, the dangers of heart disease and chorea; thirdly, the slow convalescence of the rheumatic; and, fourthly, the delicacy of the children left with chronic heart disease. The author indicated directions in which he thought some advance might be made in the management of the school attendance in these conditions. The great value of special schools for children the victims of chronic heart,

pulmonary (non-tubercular) disease, and renal disease was insisted upon. The difficult class of epileptic children he did not think could be dealt with by merely separating them into a mild group which should attend school in the usual way, and a severe group to be dealt with in the epileptic colony, because a large number of these cases were neither very mild nor very severe, and for this reason he advocated the cautious trial of a special school for this large residue. Two types of deficient children were mentioned, the morally insane, who were unfit to associate with healthy children, and those whose brains had been damaged by some such disease as cerebro-spinal meningitis, who must be dealt with individually. The dangers of chronic ear discharges, and the mental incapacity arising from severe adenoids were considered, and attention was directed to the large group of weakly children, who flagged and sometimes drifted into incurable disease during the heat of summer.

The chief points upon which stress was laid for coping with these various problems were the steady education of the general public to the dangers of rheumatism in childhood, and in particular the recognition of these dangers by those engaged in school work. The foundation of convalescent homes for the rheumatic. The gradual development of schools for the physically unfit. A closer co-operation between parents, medical men, medical officers, and school authorities, with a simplification of all certificates and a more general recognition of the value of the special schools. Lastly, the gradual evolution of an organisation of convalescent homes in the country and at the seaside, associated with country and seaside schools.

The Municipal Control of Ringworm, by H. MEREDITH RICHARDS, M.D., and WINIFRED THORP, M.B., Public Health Dept., Croydon.

Ringworm seriously interferes with school attendance. It lessens the educational opportunities of children, and detracts from the popularity of a particular school. Efforts used during period 1902–1906 to control the disease by domiciliary visits of the school nurse a failure; medical advice was usually not sought, or otherwise given up too soon.

More drastic methods were required. There was a choice of—

1. Segregation of affected cases into special schools with local treatment.
2. Exclusion of sufferers from school till treatment by local authority.

At Croydon, municipal dispensary system adopted and put into practice July, 1906.

Cases of ringworm after exclusion from school either privately treated or gratuitously by local authority. Treatment at municipal dispensary either by drugs or by X-rays. Indications for either. Average duration of cases—by X-rays, eight weeks; by drugs, thirteen weeks.

Tendency to relapse, and advisability of keeping all cured cases under observation for three months.

Possibility of stamping out ringworm.

Danish Public School and its Relation to Tuberculosis, by DR. C. C. JENSEN, Physician to the Public Schools, President of the Society of Physicians, Copenhagen.

The New Tuberculosis Act in Denmark is of the highest importance as a prophylactic measure. In the nineties, although diminishing, tuberculosis caused 14 per cent. and actual phthisis 10 per cent. of the mortality.

No great danger of child-to-child infection, but teacher-to-child infection may be serious.

The Influence of School Attendance upon the Spread of non-Notifiable Infectious Diseases, by DR. WILLIAM BUTLER, Medical Officer of Health, Willesden.

Calls attention to the frequency of measles and whooping cough, although half the deaths are under two years of age. Most of the diffusion is apparently related to the commencement of school attendance. Thinks the age incidence is not purely a matter of previous protection but of differential age susceptibility.

School closure sufficiently frequent to be effective would be impracticable. The only way of effectively reducing the mortality, the author thinks, would be to raise the age at which children should be admitted to school to seven years.

Exclusion of Children from School on Account of Infectious Disease, by DR. JAMES BEATTY, Medical Officer of Health for Northampton.

Returns were obtained affecting 14,484 school children showing—

PERCENTAGE WHO WERE REPORTED TO HAVE HAD

	Measles.	Whooping Cough.	Mumps.	Chicken Pox.
Boys ...	87·8	50·6	32·4	28·8
Girls ...	89·6	56·3	36·3	31·0
Mixed ...	89·2	51·5	38·4	28·6
Infants	80·7	45·5	29·0	24·1
ALL ...	86·2	50·7	33·2	27·9

1. All affected children to be excluded as a matter of course.
2. All "contacts" to be excluded from infants' schools.
3. Then contacts need not be excluded from the other departments provided they have already had measles.
4. If contacts are not protected in this way it is safer to exclude them, as they may be developing an attack.

Closure versus Exclusion in Relation to School Diseases, by JAMES KAYE, M.B., Medical Officer, West Riding County Council.

Under the present Board of Education regulations, if a whole school or department be closed by order of the sanitary authority there is no financial loss, and, if necessary, exemption will be granted from the rule requiring 400 meetings a year.

If separate children or classes be excluded, which is the scientific method, causing least disturbance to education, there has been since 1904 serious financial loss to the local authority.

The reasons for abolition of this epidemic grant were given as its inconsiderable amount, difficulties in administration, and that the money could be better expended on improving the instruction of pupil teachers.

The Board of Education penalise managers by a loss of about a shilling a week for every child excluded for infectious disease, and therefore Dr. Kaye moved:

> "That in the opinion of this Congress it is important to secure the prompt exclusion from school of scholars suspected to be suffering from or likely to convey infectious disease, and that the Board of Education be urged to devise some means by which this can be done, without as at present involving financial loss on the local education authority."

Diphtheria in Schools, by JAMES NIVEN, M.D., D.P.H., Medical Officer of Health for the City of Manchester.

The influence of elementary schools in disseminating diphtheria has been studied over a long series of years, and is shown statistically. Schools cannot be regarded as the strongholds of diphtheria, although they help to maintain it. The analysis of older (pre-bacteriological) outbreaks was exceedingly accurate in view of later knowledge. The special influence of schools is due to "flare-ups" of limited duration. A kind of immunity seems to have become established in infant schools, detailed analysis of Manchester experiences of recent years: much importance attached to nasal "carriers," discussion of its modes of spread in schools: urges that central bacterioscopic methods are essential, refers to the dangers of a negative swabbing. Hoffmann's bacilli not always free from danger. The superintendence of diphtheria cases it might be possible for the medical officer of health to personally manage in small districts, but in larger ones not. Undoubtedly more medical assistance is required in the public health service.

It is a mistake to close schools.

School children should not be readmitted without sufficient guarantees of immunity as a result of swabbing.

Scarlet Fever, by T. H. C. Stevenson, M.D., L.C.C. Medical Staff (Education).

Extent of protection from scarlet fever in population traced from difference of attack and death-rates at each rate, the sum of these below any age gives the protection-rate for that age. Neglecting missed cases, the protected amongst London boys varies from 2 per cent. at three years to 14½ per cent. at thirteen.

From a study of scarlatina in schools now going on, the incubation period does not appear often to exceed five days: infectivity in the family being commonest in first or second day of illness, but there is possibly much infection by missed cases, the second week being most infective, as ascertained from later information. Many children appear proof against any dose, but otherwise infection seems mainly a question of dosage. Carrier cases are suspected which later may themselves develop illness. There is not much doubt about school infection, probably chiefly due to mild cases.

Measles, by C. J. Thomas, M.B., B.Sc., L.C.C. Medical Staff (Education).

Card inquiry as to measles carried out in Woolwich for four years. At start 54 per cent. of children entering infant school aged 3 + had measles and 84 per cent. left at 6 + having had it. The disease appears in school as a crop nine to eleven days after the initial case has sickened. Conclusions in 1904 not modified since; namely, measles tends to spread when a class accumulates unprotected numbers to the extent of between 30 and 40 per cent., and when spread has begun it extends until the proportion is reduced to between 15 and 20 per cent. unprotected. To effect any useful purpose, school closure must take place before the first crop falls. The only other means of hindering the diffusion is by sanitary buildings and hygienically trained teachers. School closure practised in the most drastic way in half of Woolwich made no difference to the number of cases.

Disinfection of Schools, by J. T. Ainslie Walker, F.C.S.

The group of childish infectious diseases has not diminished proportionately to infectious diseases generally. Schools appear to play a part in the spread of infection.

Dust of schoolrooms contains germs and dry sweeping merely means stirring them up. Spraying is really needed. School disinfection is assumed as a necessity and practised daily in some American places.

SCHOOL BUILDINGS AND EQUIPMENT.

The President of the Section, Mr. T. E. COLLCOTT, Pres. R.I.B.A., in his opening address, dealt with some of the points to be considered by architects in the arrangement of school buildings. He protested very strongly against the use of glazed surfaces in schools and classrooms. Perfect as glazed tiles were when used in legitimate positions, lining lavatories, cloakrooms, etc., they were inappropriate and unsightly as wall decoration for living rooms. Too much stress could not be laid upon the importance of having warm and pleasant colouring upon the walls; the cold and drab colours which are so much used should be avoided.

The subject of the ventilation of classrooms received a good deal of attention during the Congress. Mr. Collcott, in his address, said: "Of all the systems at present in use, some of which were certainly excellent, not one could be said to approach perfection. Architects agreed that open fireplaces and open windows were essential supplements to any other kind of ventilation." As a matter of example, it was desirable that children saw that frequent changing of the atmosphere was insisted on in the classroom. No patent system of ventilation would teach them the valuable lesson that they might learn by seeing the importance of having the windows open.

SIR ASTON WEBB, in opening a discussion on the Lighting and Ventilation of Classrooms, to which subject a special meeting was devoted, pointed out that in the classroom "the scholars spend practically all their school hours, and here their mental powers are put to the greatest strain, so that it is desirable that everything possible should be done to place them under the best physical conditions.

"The size of classrooms is obviously closely related to the subject of lighting, and is necessarily regulated by the size of the classes."

"The breadth and length are, to some extent, governed by the type of seat employed, but the nearer the room approaches a square the better, with the limitation that a room can hardly be satisfactorily lighted if more than 24 feet wide, while 22 feet is better."

"For the ventilation of classrooms it is more difficult to lay down any definite rules. The problem may be simply stated as follows:—The time required to contaminate the air in a classroom of an elementary school of the capacity required per scholar (*i.e.*, 10 feet per scholar) is eight minutes, while for that of a secondary school it would be a quarter of an hour. The temperature of the room, according to the rules of the Board

of Education, has to be kept at from 56° to 60° Fahr. The problem, therefore, is how to change the air of a classroom from four to eight times an hour, and, at the same time, to avoid draughts and keep the temperature at from 56° to 60°."

"There is, I think, undoubtedly in England a strong preference for the open fireplace and the open window, and no doubt there is much to be said for them, especially in small schools; in larger ones it is impracticable. At the same time, I am strongly of opinion that an elaborate system of heating and ventilation such as may be very necessary in such buildings as law courts or hospitals, is not necessary in a school for healthy boys and girls."

"The open fireplace not only provides heat, but also a means of ventilation, and should be placed in the angle on the inner wall near the door, not on the window side, which is an outside wall, and which in such a position must place the unhappy master in a draught between the door and the fireplace."

"An extract can be obtained by another flue in the chimney stack, and fresh air may be admitted at the back of the grate and from the corridor. By this means, however, it is impossible to ensure with any certainty a regular change of air in the classroom or an even temperature. All extracts which are worked by what are called natural causes, are, in my opinion, unreliable and, under certain variable conditions of temperature or wind pressure, work uncertainly and sometimes even in directly opposite directions to that intended. To obtain results unaffected by these variations, mechanical means must be employed in the shape of rotary fans or other contrivances either to move the air by extraction or propulsion."

Ventilation of School Buildings, by David Barclay, F.R.I.B.A.

The author advocates, in connection with all systems of ventilation, that the outlets should be taken both from the floor level and from the ceiling level, working these so that when one is open the other is closed; also, that the outlets should be upon the same side of the room as the inlets. Methods of purifying air are referred to, and for economy of space the following arrangement advocated, which has been adopted with success at the Glasgow Technical College. The air subways leading from the bottom of the ventilation shaft are 10 ft. high and 12 ft. broad. Shed roofs from the four sides fill the bottom of the vertical shaft, the incline being down and inwards, like an ordinary roof inverted. The spans of the roof are of teak, and slotted for louvres, the lower ends of the spans are carried on the edges of a water tank on the ground

level. The louvres are of corrugated glass, 12 in. broad, overlapping 9 inches, with a space of three quarters of an inch between each for the entrance of air. Water is pumped up from the tank and sprayed over the upper part of the roofs, the same water being used for 24 hours.

The Heating and Ventilation of School Buildings, by W. Nelson Haden, M.I.Mech.E., Trowbridge.

The importance of the correct apportionment of available money on decorative treatment on the one hand and on essentials on the other referred to. What constitutes a healthy atmosphere is the province of the medical hygienist, and he has conspicuously failed to lay down a self-consistent specification of requirements. In spite of criticism the engineer can certainly produce results in accordance with the best specification hitherto drawn up. The medical sanitarian must do his duty, and give a clear pronouncement. Points wherein defects may occur are pointed out, and emphasis laid upon the removal of dust; the perceptible motion of air. Climatic conditions and warming are considered. Importance of the necessity for all fresh-air ducts to be accessible for cleansing. Respective costs of working of various systems considered.

The Natural Lighting of Schools and Classrooms, by Dr. Stanislaw Ruzicka, Lecturer in Hygiene, Bohemian University in Prague.

Artificial lighting is simple; intensity and direction of light are within control. In natural lighting these factors, and especially the intensity, are variable.

The lowest intensity of light (*e.g.*, in December at Prague) from the sky being 2000, the school building, etc., must be so arranged that the darkest scholar's desk should have at least 20, or 1 per cent. of the firmament intensity. This is a relation which remains constant for all variations of daylight intensity. Older methods of measurement of light were all unsatisfactory; this new method of the author of relative Photometry alone eliminates all sources of error. This method is as follows:—A rough model of the proposed school is made; this model is placed in a large box, the ceiling of which is constructed to represent the sky; one side represents the front wall of the building opposite the school—the other sides consist of mirrors; the back is removed to allow access. When a measurement is being taken this aperture is covered with a cloth, and the only source of light is the artificial sky. The relative photometer is so constructed that the mirror plane of a Summer-Brodhun cube reflects (through small apertures in the roof of the model) to the observer's eye the image of any particular spot in the schoolroom, so that it appears as a spot in the centre of a greater and brighter image of a portion of the artificial sky reflected by a mirror behind the Summer-Brodhun cube. A movable wedge of grey glass is then shifted over the image of the ceiling until it is reduced to an identical brightness with the image; thus a reading can be got giving the relation of any spot in the model to the ceiling brightness.

The Central Hall System for Public Elementary Schools, by G. TOPHAM FORREST, Newcastle-on-Tyne.

Since the Act of 1902 renewed attention paid to schools so that school planning is to-day on a new footing. The development of the school plan has been from the old grammar school, one large hall through the long room of the pupil teacher system to class-rooms grouped round a hall. The hall forms a means, especially in winter, of affording ventilation; for Board of Education rules about 10 sq. ft. per head is inadequate space if ventilation is considered. Inlets for ventilation generally are too small.

Apart from ventilation and lighting, halls have educational advantages, in permitting supervision, without disturbing classes. Halls should not be wholly surrounded by classrooms, partly because the roof might become blocked by snow, and also because it is very desirable that one side should be accessible to light and air.

Internal Arrangement and Equipment of Secondary Schools, by JAMES GRAHAM.

The paper contains notes on the more important features of the West Leeds High School. The school has been designed to hold 600 pupils, 300 girls and 300 boys. It consists of a basement and three other floors. The technical class-rooms and laboratories are in the basement, the ordinary and special subject rooms on the two middle floors, and the practical rooms (art, sewing, cookery) on the top floor. The hospital plan of avoiding accumulation of dust has been adopted, all junctions are rounded, and the walls finished smooth. Part of the roof has been made flat. This will be used as science flats for teaching local geography, methods for estimating sunshine, rainfall, and there will be a conservatory for growing plants for use in the botany and art classes. The building is now being completed, and is estimated to cost £26,000. The total cost of the site, buildings, and fittings, will be £42,000.

Sanitary Appliances for Schools, by CHARLES PORTER, M.D., B.Sc., Asst. Medical Officer of Health, Leeds.

Even in many new schools the favourite type of convenience is still a trough latrine in a compartmented building. These usually provided with an automatic or hand flush.

Objections to troughs. Troughs probably are still kept in existence by the Board of Education regulations requiring conveniences in separate buildings.

Various forms of objectionable closets described. Description of the wash-down closets in West Leeds High School. The cost. The educational effect of cleanly modern conveniences in the building.

The Desk: The Hygienic Point of Writing and Limits of Slope, by THOMAS WOOD, M.D., J.P., Leith.

The characteristics of the ideal desk are stated. To determine the "hygienic writing-point" two factors must be known, the exact sitting space of the child and the length of forearm; these known, a formula is given by means of which the point may be ascertained. Measurements are given of 2,600 children in support of this conclusion. The slope of writing is determined by the degree of pronation of the wrist, and the limits of slope are from vertical to 35 deg. from the vertical.

School Hygiene in the Board Schools of Stockholm, by JOSEPH HAMMAR, M.D., Stockholm.

A short account is given of investigations made by three Stockholm school doctors. The subjects selected were (1) position adopted by children when writing, with a view to discovering cause of scoliosis present among many of the children seen; (2) ventilation and heating of schools; (3) causes of fatigue. In this connection it was noted that the early morning hours did not show the best work, due, no doubt, to insufficient sleep.

Noises in the Schoolroom, by A. J. PRESSLAND, B.A., Edinburgh Academy.

Difficulties of noise from echoes in rooms; from furniture (particularly dual desks); from the noises of the street. The necessity for improvements.

The valuable outcome of these debates, shown already in the press, is the change of tone used in discussing the vexed question of the educational ladder, and the giving every child his chance.

It is beginning to be felt that that policy has been short-sighted which has only picked out the clever boy or girl, lifting them out of the ranks, and making them into school teachers, leaving the ordinary and the dull where they were, or still ordinary and a little duller. Henceforth the true democracy in education must lead to the raising of every boy and girl a little higher in their own walk of life, so that ultimately we may have well-educated and intelligent labourers, artisans, middlemen, and manufacturers.

RESOLUTIONS PASSED AT THE CONGRESS.

WHEREAS the maintenance and development of the health and vigour of school children is a matter of paramount importance, and whereas experience in all large cities has shown the importance of health inspection, BE IT RESOLVED that in every city and town adequate provision should be made both for sanitary inspection of schools and for medical inspection of school children, the latter to include not only inspection for contagious diseases, but also of eyes, ears, teeth, throat and nose, and of general physical condition.

WHEREAS the improvement in the health of and the hygienic conditions surrounding school children depends largely upon the intelligent operation, the competency, the interest, and the faithfulness of teachers and principals in matters of hygienic importance; BE IT RESOLVED that all schools having courses for the training of teachers should give instruction in:—

(a) Personal and School Hygiene; and

(b) The principles and practice of physical training.

And that to each of these subjects should be given as much time as the main subjects in the course.

That this Section is of the opinion that the principles and practice of hygiene should form part of the education of every citizen.

That practical and theoretical instruction in personal and school hygiene should form a regular part of the curriculum of all institutions in which students are trained to become teachers in schools of all grades.

THAT in order to make suitable provision for those partially deaf children who could better be taught in a hearing environment, special classes should be provided under the management of teachers qualified to teach articulation and lip-reading to the deaf. Such classes to be in each country under special legislation affecting afflicted children.

THAT, in the opinion of this Congress, it is important to secure the prompt exclusion from school of scholars suspected to be suffering from or likely to convey infectious sickness, and that the Board of Education be urged to devise some means by which this can be done without as at present involving financial loss on the local education authority.

IN the opinion of this meeting it is desirable that all Secondary Schools, including Public Schools, should be subjected to inspection on matters relating to Hygiene and Sanitation, and that a copy of this Resolution should be forwarded to the President of the Board of Education praying him to take such steps as he may consider necessary to carry such inspection into effect.

The following resolution was passed in Section I. by a large majority, but was not reported at the General Meeting of the Congress:—

OBJECTIVE instruction being far less fatiguing to the memory, and much better fitted to invigorate the intellectual powers than instruction which makes use of words only, it is desirable that systematic arrangements should be made for enabling both teachers and pupils to have constant access to sources of natural knowledge, including museums.

COUNCIL OF REFERENCE ON SCHOOL HYGIENE.

At the close of the Congress the following letter was circulated explaining the formation of a Council of Reference:—

SIR,—As a slightly incorrect statement was published, it would be as well to explain in some detail the important new move in the matter of School Hygiene which was taken at the closing meeting of the recent International Congress.

The permanent International Committee consisting of about sixty members selected from almost every country has hitherto only met during Congresses. Arising out of the question of whether it would not be a proper thing to establish a Bureau, with a permanent staff, library and museum, and so on, in some central but neutral spot, such as a Swiss or Dutch town, it was decided as explained by Drs. Mathieu, Burgerstein, and Kerr, that it would probably lead to greater progress if such Bureau was not localized, but if each country had its own centre for the diffusion of knowledge, and to act as a clearing house in the matter of School Hygiene statistics, laws, and regulations. Finally, to supervise in scientific matters and generally to do all that is possible at all times or places to forward the human interests which are bound up in the special lines of knowledge included in School Hygiene, the International Committee has formed a small Council.

This Council has all the powers of an ordinary Committee. It can form sub-committees of experts on special enquiries. The usual committee procedure is to sit round a table and discuss matters, but this Council will deal with the various subjects that arise, submitting the different topics by correspondence, collating the answers, and finally making pronouncements in urgent matters after a meeting of the Council.

It is obvious that for efficiency such Council should be small and yet have in it elements to secure permanence, and at the same time possibilities of slow but constant change. This has been done by deciding that it shall consist of the president of the past Congress, the president of the Congress which has just been held, and the president of the next Congress. Nine other members are to be elected, of whom three are to be from the country where the Congress was last held, and three from the country where it will be held next, three being selected from other lands.

Certain matters for instance will almost at once come under the consideration of this Council. Such might be quoted as:—

"The question of how medical inspection of schools can best be carried out with the maximum of efficiency and minimum of cost.

"The question of how far the laws of health can best be imparted to the coming generation, so that later they will know how to care for themselves and those dependent on them.

"The best systems or methods of physical training for both sexes at various ages.

"The feeding of children requiring proper nutrition, so that it shall be done without developing pauperism and with regard to those upon whom the cost falls."

These four matters are being dealt with practically in a great variety of ways, and this Council should be able to collect and analyse known facts to show which methods are best for any town or state.

It is obvious that information thus digested will have a very great value politically as well as educationally, and this Council may in time come to be officially regarded as quite analogous in matters of School Hygiene, to that other Congress of Peace now in session at the Hague.

Yours faithfully,

LAUDER BRUNTON, *President.*

JAMES KERR, E. WHITE WALLIS, *Hon. General Secretaries.*

London, *August 15th,* 1907.

NOTES ON LEGISLATION AND LAW CASES.

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For full text of these see Law Reports, which can be referred to in the Library of the Institute.

REFUSE REMOVAL.—*Hotel—Trade refuse—Dispute between occupier and sanitary authority—Decision of petty sessional court "shall be final"—Appeal by special case—Summary Jurisdiction Act, 1879 (42 & 43 Vict. c. 49), s. 33—Metropolis Management Acts—Public Health (London) Act, 1891 (54 & 55 Vict. c. 76), s. 33, sub-s. 2.*

In any dispute between occupier and sanitary authority as to what is considered trade refuse, the decision of the magistrate under s. 33, sub-s. 2, of the Public Health (London) Act, 1891, is final, and no appeal will lie to the High Court, notwithstanding the general provisions of the Summary Jurisdiction Act, 1879, s. 33, giving any person aggrieved by a decision of the magistrate on a question of law the right to require a case to be stated for the opinion of the High Court.

Reg. v. Bridge (1890) 24 Q.B.D. 609, distinguished.

Per Buckley L.J.: Whether in this case it is still competent for a magistrate to give his decision subject to a case for the opinion of the High Court, quaere?

The decision of the Divisional Court (1906) 2 K.B. 39 affirmed.

WESTMINSTER CORPORATION v. GORDON HOTELS, LTD., C.A., 910. 1 K.B. June, 1907.

SEWERS.—*Connecting Pipe—Local Government—Sewer passing through private ground—Drain—Right to connect—Public Health Act, 1875 (38 & 39 Vict., c. 55), s. 21.*

The plaintiff was the owner of a house and garden adjoining a passage which was the property of the defendants. Beneath the surface of the passage was a pipe which, by reason of the fact that it received the drainage of more than one building, was a sewer within the meaning of the Public Health Act, 1875. The plaintiff, for the purpose of draining his house, carried a pipe through his garden, and the local authority, at his request, placed a pipe in the soil of the passage to connect the plaintiff's drain with the sewer. The defendants removed the connecting pipe from the passage, and the plaintiff sued them for trespass in so doing:—

Held that, although the plaintiff was entitled under s. 21 of the Public Health Act, 1875, to connect his drains with the sewers of the local authority, neither the plaintiff nor the local authority had any right to place the connecting pipe in the defendants' land, and that the action therefore failed.

WOOD v. EALING TENANTS, LTD. Div. Ct., 390. 2 K.B. Aug., 1907.

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JOURNAL

OF

THE ROYAL SANITARY INSTITUTE

DISCUSSION ON TYPHOID FEVER,

Opened by F. C. DOUGLAS, M.D., D.P.H.,

(MEMBER.)

At Sessional Meeting, Montreal, December 19th, 1906.

Typhoid Fever Epidemic at Fort William, Ont., Canada.

FORT WILLIAM, Province of Ontario, Canada (population 7,691, census 1905), is situated at the head of Lake Superior, on Thunder Bay.

A great portion of the town lies along the northern bank of the Kaministiquia River extending over a tract of about 7,000 acres, and having within its boundaries two large rivers, the Kaministiquia and the Neebing. The deposit on which the town is built is of an alluvial nature, bounded by a range of sand hills twenty to fifty feet in height. At a distance of five to seven miles the ground rises into mountains of trap-rock. This deposit is about one foot above the lake surface, and gradually rises within the limits of the town to about twenty or thirty feet above the river. The deposit consists of six or eight feet of mould lying upon a bed of quicksand from two to four feet in depth, lying upon a bed of dense blue clay, which in turn lies upon a bed of rock, existing at various depths throughout the town, its distance from the surface ranging between nineteen and fifty ft. Seventeen miles above Fort William the waters of the Kaministiquia make a downward fall of 117 feet, and at this place, called Kaka Beka Falls, large electrical works are under construction, where during the past year from 200 to 500 men have been constantly employed. There are also several brick-yards and several farms along the banks of the Kaministiquia River at no great distance from the town.

Fort William derives its water supply from the Kaministiquia River.

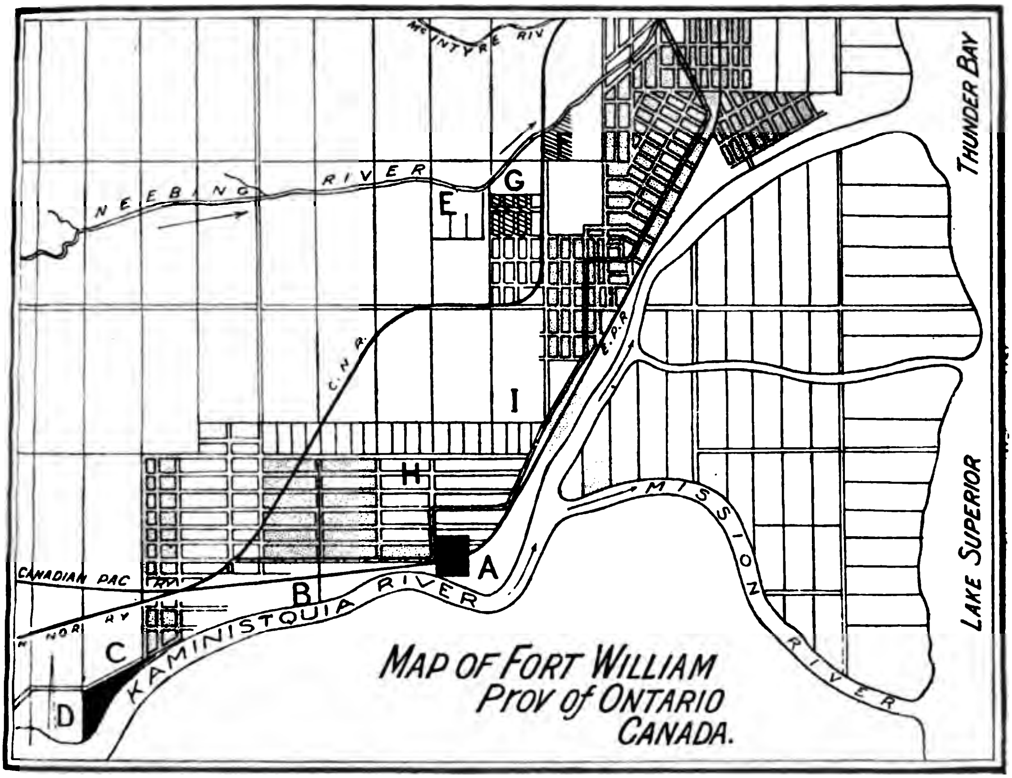
about two miles from its mouth, and above the most populous part of the town. This water is taken at a depth of about twenty-eight feet and thirty-five feet from the shore; it is lifted about fourteen feet by suction and pumped directly through the mains; the pressure in the mains is is 50 pounds, which can be increased in time of fire to 100 pounds. Pumps raise and distribute 350,000 to 400,000 gallons daily.

There are 1,400 houses in the town, about 1,300 of these are directly connected with the water mains, and those houses where there are no connections take the city water from street hydrants or from their neighbours. A few houses on the northern outskirts take water from the Neebing River, and one woman who keeps a small boarding-house near the centre of the town uses water from a well on her premises. There are five sewage outlets, four being openings below the intake pipe, one about half a mile below and the others about two miles. One sewer, of the old box style, constructed in the year 1889, has an outlet into the river only about 1,400 feet above the intake pipe. Until two years ago this was only used for *drainage* purposes, but, the town growing rapidly, *five connections* had to be made to this in 1904 from houses in West Fort.

The rate of the current of the river at the intake is only about two miles an hour, and there is a bend in the river which is said to deflect to its northern side part of the sewage from the sewer which lies above; so that the intake pipe, which in its normal position is about thirty-five feet out, misses the larger amount of the sewage which clings to the northern side of the bank. West Fort Coal Dock, where boats are loaded with coal, is one mile above the intake pipe. There are here about forty houses and 150 people; the houses, most of them small shacks, are about ninety feet from the river bank. The sanitary arrangements are very bad, a good deal of excreta and garbage being thrown into a small ravine, at the bottom of which is a stream running at right angles to the Kaministiquia River and emptying into it.

At the town power-house there is along the bank of the river a box-drain receiving the sewage and waste matters from two water-closets and urinals. This box-drain lies, one would almost say, directly over the place from which the water supply is pumped, and opens at a point only 100 feet below the intake pipe. Eight men are employed in the town power-house.

In the year 1905 about 660 vessels arrived and departed from this harbour, and about ten per cent. of them delivered their cargo at a point one mile above the intake, at the West Fort Coal Dock.



TYPHOID EPIDEMIC DURING MONTHS OF JANUARY, FEBRUARY, AND MARCH, 1906.

Areas marked = parts most affected. Dotted Areas = parts affected from Neebing River, on which Town Pump was situated.

A—Position of Pumping Station.
B— „ Forde Street Sewer, 1,400 feet above intake.
C— „ Foreign Community, 1½ miles „ „
D— „ Small ravine into which excreta from C was thrown.
E— „ Town Pump on Neebing River.
F and G— „ Community affected from Town Pump.
H and I— „ Artesian Wells.

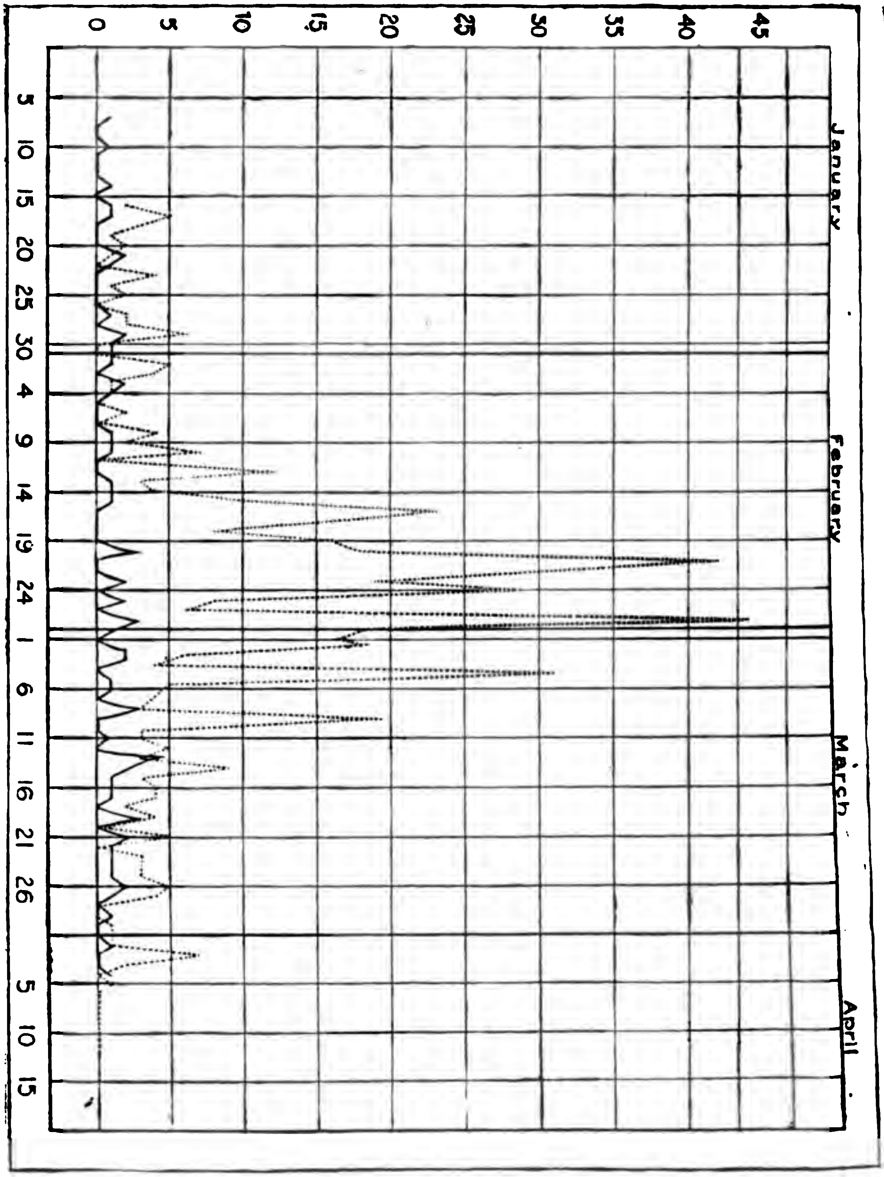


CHART SHOWING NUMBER OF CASES REPORTED DAILY.

Dotted Line = Cases; Black Line = Deaths.

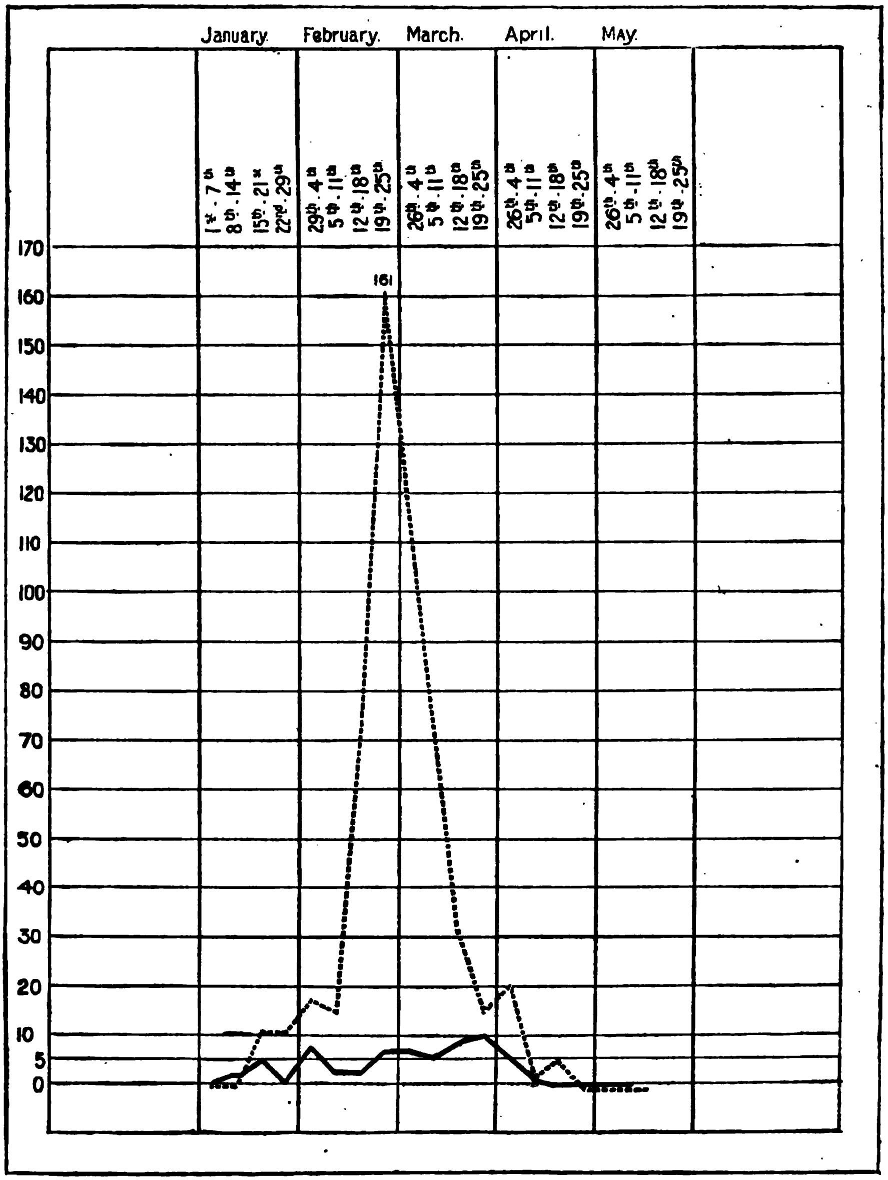


CHART SHOWING NUMBER OF CASES REPORTED MONTHLY.

Dotted Line = Cases.

Black Line = Deaths.

Typhoid seems to have been endemic in this locality for a number of years, the oldest inhabitants speaking of low fever and malarial fever, which probably were typhoid; but evidently there has been for the last two or three years a feeling among the people that the number of typhoid cases was getting greater each year, and the doctors and medical officer of health suspected something was wrong with the water supply, for, searching through the reports in the City Clerk's Office and the books of the McKellar Hospital, built in 1903 and the only hospital in the town, I came upon the following facts :—

1.—1903. Deaths from typhoid, 6; population, 5,641, *i.e.*, death-rate per 1,000, 1·05. Taking 10% as the average number of deaths from typhoid, typhoid fever-rate per 1,000, 10·50. Admittance to hospital, 24.

2.—1904. Deaths from typhoid, 14; population, 5,718; *i.e.*, death-rate per 1,000, 2·43; case-rate per 1,000, 24·30. Admittance to hospital for typhoid, 126.

Increase of typhoid case-rate per 1,000 in 1903, 13·80.
" " death-rate " " 1·38.

This great increase was evidently noted by the provincial authorities, as I found the following reports :—

1. January 6th, 1905, a sample of ice taken from the mouth of the river was sent to Toronto. A report was sent back stating that it contained only two parts of chlorine per million, and showed neither chemical nor bacterial infection; the analysis said, however, that there must be some mistake in the sample, as no water polluted by sewage could be in so pure a state.

2. February 17th, the Provincial Medical Health Officer, in a letter, states that, in a report from Dr. Bell, he learns that the Board has not enforced the notification of typhoid cases; he also asks that, as sewers empty into the river above the intake pipe, exact plans and specifications of the same be sent him.

3. On September 8th, 1905, a letter from the Provincial Medical Health Officer states that he had 15 cases of typhoid with one death reported for that month, and strongly urges that the water used should be boiled, and that the Board of Health should prevent the pollution of the river above the intake as much as possible.

4. On September 15th, 1905, a notice appeared in the local paper

instructing every person to boil all water. This ran for one month, when some objection being raised in the council, the notice was left out.

5. On October 20th, 1905, samples sent to the Medical Health Officer for analysis showed the presence of colon bacilli.

This activity shown by the local and provincial authorities resulted in the diminution of the number of cases for 1905.

Population 6,491; number of deaths from typhoid 10, compared with 14 of the previous year.

Typhoid death-rate per 1,000 population,	1905	1·57
" " " " "	1904	2·43
" case " " "	1905	15·70
" " " " "	1904	24·30
Admittance to McKellar Hospital	1905	94
" " "	1904	124

Diminution case-rate per 1,000, ·86; case-rate per 1,000, 8·6

Showing that some of the people at least were growing more careful, were boiling their drinking water, and taking other precautionary measures.

In the early part of January, 1906, an analysis of water from the town pumping station showed that the water contained streptococci and colon bacilli, and it was pronounced dangerous, as it showed marked sewage pollution.

On January 17th, 1906, the reporting of typhoid fever cases to the local medical officer of health was insisted on, and the number of cases reported daily is shown in the chart (p. 424).

The great variation in this from day to day is due mostly, I think, to the fact that the local doctors would wait till they had four or five cases to report, and then report them in a lump, so to speak, as the epidemic was characterised by a steady rise of the number of cases to the climax, then, with proper hygienic measures and systematic handling of the epidemic, by a steady decline.

January number of cases reported (from 17th to 31st) 28; but there must have been, however, a great many more unreported, as deaths from from typhoid in the month numbered 13:—3 foreign, 1 English, 1 United States, 8 Canadians.

Taking 10 per cent. as the average number of deaths from typhoid, the number of cases December and January should be 130. February total number of typhoid cases reported, 425. Number of deaths, 20:—12 males, 8 females; 14 Canadians, 1 English, 5 foreign.

It also seems that in February there were a great many extra cases which were not reported, and the town authorities realised about the middle of February that an epidemic had set in. On February 16th the Mayor advised the Provincial Board of Health of Ontario that typhoid fever was increasing, and asked for the best sanitary authority in Canada. Dr. Starkey, Professor of Hygiene, McGill University, Montreal, was recommended, and having been wired for immediately, left for Fort William on the 28th of February. On his arrival, going thoroughly over the ground, he absolutely condemned the water supply, and drew up the following plan of action:—

1. Systematic placarding of all houses where typhoid occurred.
2. Distribution of public notices for all houses.
3. Distribution of notices for houses where typhoid existed.
4. Systematic inspection by competent inspectors.
5. The thorough cleaning up of the town.
6. The provision of a temporary supply of water for drinking purposes.

The placard used was as follows:—

TYPHOID FEVER
IN THIS HOUSE.

Any person or persons removing this Notice without the permission of the Board of Health or one of its Officers shall be liable, for every such offence, to a penalty of not less than $5 nor more than $50, in the discretion of the convicting Justices or Magistrates, besides costs, which may also be inflicted pursuant to the provisions of "The Public Health Act."

BY ORDER OF
The Local Board of Health.

On February 21st nurses were sent for from Winnipeg. On the 26th of February a hospital was opened in the Coal Dock section in the C.P.R. Bunk House, with 28 patients. One week later the Finland Church, with the consent of the Finns, was turned into a hospital, on the understanding that only Finns were to be admitted.

On the 8th of March it was found necessary to open another hospital and the auditorium in the city hall was utilised; the stage was used for female patients, and the rest of the space for males.

On the 26th of February, after a public meeting, it was decided to open an artesian well to supply the public with drinking water, and four large tank-carts were constructed for distribution.

Upon the recommendation of Prof. Starkey, I was invited to take charge of the measures for combating the epidemic. I arrived from Montreal on the 10th of March, accompanied by Mr. Watson, a competent

Scotch sanitary inspector, and immediately began work. Two tons of crude carbolic were ordered for free distribution to the people. All the local doctors were asked to co-operate by reporting cases immediately, either by telephone or writing, to an office fitted up in the City Hall as temporary headquarters. Three inspectors were instructed and thirty-five nurses in the temporary hospitals and as district nurses. Every house where typhoid was known to exist was placarded. Immediately on receiving a report of a case, the inspector in whose district the case was went to the house, placarded it, handed in the notices, and reported to the office as to isolation, etc., he instructed persons in attendance how to disinfect excreta and linen (giving practical demonstration), warned them of the danger of contact, and instructed them as to the care of the hands after attendance on patients.

Personally, I made visits first to all hotels, boarding houses, restaurants, and places where food was stored or sold, and then to the private houses. The conditions found will explain in some measure a great many cases.

1. Lack of isolation; in many cases patients in boarding houses with six or seven others in the same room.

2. Improper disposal of excreta; very often excreta would be found standing about in vessels, or thrown into the back-yards and sometimes into the street. Where any attempt was made at disinfection, it was improperly done, a few grains of chloride of lime being placed on the excreta, which was then simply consigned to the water-closet, privy, or yard.

3. Bed and body linen were not disinfected; in some instances they were simply taken from the patient or the bed and sent to the laundry, and at least three Chinamen appear to have caught the disease in this way.

4. The non-disinfection of the hands of people in attendance.

5. Women, even in public places, and in eighty per cent. of private cases, were in attendance on typhoid patients, and were at the same time taking care of the cooking and food stuffs of the family; dishes, plates, and spoons used by typhoid patients were mingled with the other articles of the household.

6. Although the water was not being drunk, it was still used for rinsing jugs, cans, etc., in which milk and other food stuffs were put.

7. Carpets, bedding, and mattresses were shaken outside without any attempt at disinfection.

8. Children were allowed to run about in typhoid rooms.

9. All the while 1,300 houses were supplied with infected water, and only 400 to 500 had any sewage connection whatever.

The Coal Dock section, in the north-eastern part of the town, presented a difficult problem. The people were mostly foreigners, and the houses shacks, with very often ten or twelve persons living and sleeping in one room; as there was no attempt at any sanitary arrangement as to disposal of excreta, it was found necessary to have three special constables sworn in to enforce the people to carry out instructions. To save time and get a good idea of the condition of houses visited by inspectors, also to know whether they were doing their work properly, I drew up a form for infected houses, and for all houses; these were filled in and handed in to me at noon and at eight o'clock.

I strongly advised the Water and Light Commissioners to make some attempt at supplying other water to the citizens from wells, etc., and to cut off the tap connections, leaving only water for sewage purposes. This, however, they thought to be impracticable, and so cards—eight inches by twelve—were printed with the following notice in large type, in red:—

WARNING.

This water is unsafe for use of any kind unless boiled for fifteen minutes.

By order,

Water and Light Commissioners.

Do not remove this card.

This was placed over every tap in the town. With constant vigilance, cases began to get fewer day by day.

Then a public announcement was made through the press that if patients, as soon as they were well and about, announced the fact to the Health Office and followed out the printed instructions as to disinfection of room and satisfied the inspector, the placard would be raised. This was very effective, in that people were more careful to follow the one plan of disinfection to the letter in order to get rid of the obnoxious placard.

Previously all sorts of devices for disinfection had been in force, but proved utterly useless, such as:

1. Burning sulphur on the stove;
2. Burning small formaldehyde candles,

without attempting to close up room, etc. Our plan, as per printed directions, was found to be the best in that it assured *absolute cleanliness*.

On the 2nd and 3rd of April a small flare up of the epidemic occurred, 7 cases being reported. Tracing this up I found that the cases occurred in the section of the town where people took water from the Neebing

River. Three miles up this river is situated the refuse dumping ground, and night soil had been carted there and dumped on the river banks. There had been a thaw, with the result that another water supply was contaminated.

The attention of the Board of Health was drawn to the dirty and insanitary condition of the city. There were 1,400 houses with water supply, and only 400 with water-closets; privies that had had practically no cleaning for years, and hundreds of houses with not even a privy. Garbage, manure, and dirt were scattered around everywhere, and pollution of soil both with organic matter and with typhoid germs constantly going on. Inspector Watson was placed in charge, and a good clean up ensued. Sanitary notices were printed and issued in different districts, advising people that scavengers would call on a certain date, and that all garbage, etc., must be collected, yards cleaned up, etc., and dirt collected in heaps, or the city would put men to work and would charge for the same. All privies were cleaned up, and an attempt made at disinfection; the pail system with dry earth was advocated for privies; the nuisance ground was entirely renovated, and the pollution of the river stopped.

The total number of deaths from the 1st of January to April 16th was 69: of these 36 were Canadians, 8 British, and 22 foreign; and the average age 24. In the three and a half months the number of deaths per 1,000 of population was 8·04.

There were 585 cases reported to the office from the 1st of January until April 18th. Not being satisfied with this I had a house-to-house census, which showed that 840 cases had occurred, the population being 7,691 from census in 1905: *i.e.*, case-rate per 1,000 of population in three and a half months, 109·08; or one out of every 9·55 of the citizens had had typhoid fever.

Causes of the epidemic may be summed up as—

1. Remote.
2. Immediate.

1.—Remote.

1. Presence of numerous endemic cases without report of same to the authorities.

2. Systematic pollution of soil and general insanitary condition of the whole place.

3. Contamination of the water supply with sewage.

2.—IMMEDIATE.

1. The specific contamination of the water supply.
2. *Direct contact or contagion.*

In November, 1905, the intake pipe was broken by the driving anchor of a boat, and the city took its supply from a point 15 feet from a lee shore, in reeds and rushes to which the sewage from Forde Street sewer was naturally deflected, so that the water was contaminated directly and indirectly.

a. From Forde Street sewer, to which excreta from two cases of typhoid had access early in December, 1905, from corner of Gore and Edward Streets, West Fort; and from Queen's Hotel, West Fort, four cases in January and early part of February.

b. From the town pumping station, from which four patients were taken in December, 1905, and January, 1906, the excretion of these running in a leaky box-drain directly over the place from which the city water supply was taken, and from the opening of the drain 100 feet below.

c. From the West Fort Coal Dock, from which two cases were taken early in January.

d. From a boat, which lay at the docks, having two cases of typhoid fever on board and excretions thrown into river.

Prior to my departure I drew up a report for the city council, and asked for their consideration of the following:—

1. Knowing the cause of the epidemic to have been polluted Kaministiquia water, you do not even suggest to the public that in the future it will be safe (or even safer than it was) for use without boiling; and I do not consider that you can even effectually protect the waters above the intake from pollution. One has only to consider for what other purposes the river is used, navigation, boating, etc., and to remember that the urine of typhoid patients contains specific germs for some weeks after they are convalescent, and that it is already known that it also contains other dangerous germs, such as streptococci from some unknown source, to understand the dangers. Boil the water for fifteen minutes or pass it through a Berkefeld filter and it will be safe, and only this may be used until such time as you get a permanent water system installed.

2. This city is badly in need of a proper sewage system, and until you install sanitary arrangements in every house, proper care should be taken as regards privies, etc., in order to stop the great pollution of the soil which has been going on for a number of years, and which, if not looked after, will cause much trouble in the future.

3. That building by-laws be drawn up to prevent the putting up of shacks of any sort.

4. That, owing to the great influx of foreign persons, your boarding-houses be licensed, and be kept under strict supervision as to ventilation, overcrowding, and cleanliness.

5. Supervision of dairies and places where food stuff is supplied, including proper inspection of meats, fish, and vegetables.

6. That a proper office for the medical health officer be installed in the city hall, with a set of office books, for registration of births, deaths, infectious diseases, complaints, inspectors' reports, etc.

7. That an understanding with the Ontario authorities be arrived at as to what extent this city is responsible for the care of patients with infectious diseases coming from outside municipalities.

8. That a proper incinerator for the destruction of garbage be arranged for.

Up to the time of writing this report (July 25th, 1907) very few cases of typhoid have been reported, and these, so the medical officer of health states, brought in from surrounding lumber and mining camps. The city council have passed a by-law for the expenditure of $250,000 for a new water supply, to be taken from a lake on the top of Mount McKay, three miles from the town and about two thousand feet above it, the watershed to be protected for fifty miles; also they have plans for a new sewage system and an incinerator.

PROF. STARKEY (Montreal) stated that in his opinion the typhoid epidemic at Fort William was a splendid object-lesson to all, of what can result from bad sanitation, the use of slightly contaminated drinking water, and the inefficiency of a sanitary authority. It was also an instance proving the urgent need of properly qualified public health officials who knew how to deal with such matters. When he went to Fort William to direct affairs, he undertook that direction solely on the understanding that all his advice would be strictly carried out. He found the authorities and the public so alarmed at the proportions of the epidemic that they were willing to accede to anything as long as it promised speedy deliverance. Under these circumstances, he was rash enough to prophesy that the epidemic would be well in hand within twenty-one days, *i.e.*, the time of incubation of typhoid; for of course those individuals who had contracted the disease within the few days prior to commencement of operations would only show up as cases within the incubation period. Dr. Douglas was sent to carry out the plan of action, and his results showed how well he carried out his

duties as medical officer of health. Those results also showed in a most striking manner the accuracy and the truth of the statement that typhoid can be prevented, even under such alarming and adverse conditions as existed in Fort William when they took charge. There was really no excuse for the prevalence of typhoid which existed in Canada; it was always a question of neglect and incompetency on the part of those in authority when such outbreaks occurred and were allowed to continue. Another important point brought out by this epidemic was the incubation period of typhoid. He had had ample opportunity of noting this, and in nearly all instances it worked out as ten to twelve days, the average eleven days. As regards an account of the sanitary condition of Fort William, with reports upon water supplies, analyses, etc., full information could be obtained from his printed report.

MR. MARCEAU (Civil Engineer) thought it was high time engineers should refrain from polluting rivers, etc., from which water supplies were derived, and that this point ought to be brought home more to town councils, etc., when these bodies were considering water and sewage schemes. At such a stage the engineer was the man to bring this matter to their notice.

DR. SCANE referred to a similar condition of affairs in the town where he lived, as in Fort William prior to the epidemic, viz., the pollution of a river by sewage, which river was utilised for drinking purposes. Quite recently an attempt had been made to stop this pouring in of sewage, and they had been advised to construct small cesspools near the river bank; such cesspools were not water-tight, and naturally the overflow found its way directly into the river. He wondered whether conditions had been much improved, and inquired if the Provincial Board of Health of Quebec could not enforce better sanitary arrangements.

DR. PELLETIER (representing the Provincial Board of Health, Quebec), in reply to Dr. Scane's question, said he was afraid the Board had not sufficient powers to alter things directly, because under the present laws a cesspool was sanctioned and fulfilled all requirements. He said the local authorities must move in the matter, and more was certainly to be expected of them.

ADJOURNED DISCUSSION ON
TYPHOID FEVER,

Opened by T. A. STARKEY, D.P.H., M.B., M.R.C.S., L.R.C.P.,
Professor of Hygiene, McGill University,
(FELLOW).

At Sessional Meeting, Montreal, 11th January, 1907.

IN this paper I wish to lay stress upon the part played by defective sanitary arrangements in and around houses in the causation and spread of typhoid fever, and incidentally appeal to architects and sanitary engineers to exert a little more influence and pressure upon the public with whom they come into contact whilst practising their respective professions.

In the large majority of typhoid epidemics, the immediate channel of transmission of the typhoid bacillus has been water, in not a few cases milk, but only in a very small minority has the direct carrier been some form of food (*e.g.*, green vegetables, etc.).

In Canada, as in most other countries, it has been a most noticeable fact that the severe typhoid epidemics have always occurred in towns of rather recent growth, and particularly devoid of good sanitary appliances and arrangements in and around the houses.

I am not speaking, of course, of those epidemics of small proportions, say of 20 to 50 cases or so, but those assuming large proportions; for instance, such as occurred at Fort William, Ont., where more than 800 cases appeared in a population of 7,500.

As I have already remarked, in the large majority of instances the primary cause is polluted drinking-water, which gives rise to fairly numerous cases scattered pretty uniformly over the area of water distribution. It is from these scattered cases, each acting as a separate centre or focus of further infection, that many more cases are derived by personal infection (used in its broadest sense), thus giving rise to the full-blown epidemic.

It is with this latter class of infections that I am here more particularly concerned. The direct infectious agent is, of course, the excreta,

and it depends entirely whether or not the people are able to so dispose of this material as to effectually prevent any contamination either of persons or things with which people must come into contact.

Let me cite an instance of what I mean. During a severe epidemic I came across a family of seven: the father and one son had been removed to a hospital, but further accommodation could not be obtained; the mother and two other children went down with the disease, leaving two children to look after them in the house. Occasional help was given, but, owing to the enormous proportions of the epidemic, constant attendance could not be provided. Now, please note that in spite of all instructions with reference to disinfection of stools, etc., before being disposed of by depositing in a privy in the back area, this infectious material was literally plastered on everything, tables, chairs, floors, even door-knobs; and, lastly, on the surface of the ground at the back of the house.

No wonder that the infection spread to the houses immediately contiguous, and also that anyone who visited the houses not observing the most rigorous precautions (which was seldom done, by the way) ran a great risk of contracting the disease, as in fact many people did contract it, even including the sanitary inspector.

I wish to emphasise the spread of infection from house to house. I was quite satisfied that the infected ground at the backs of houses was a direct means of transmission of the infection. Whether the material was carried precisely by people walking over this ground, or whether it was carried by some other agent, is immaterial: the fact remains that it was carried, for in nearly all these instances the back areas were not walled off, but people had free access from house to house at the back.

I have during the last ten years come across a number of similar cases; not, perhaps, quite so gross regarding the neglect and lack of attention as the one above cited, but nevertheless in nearly all instances the ground around the houses became infected because the excreta had to be disposed of by the privy system or by some method closely allied to it.

As a contrast I have also noted that when a case cropped up in a house furnished with good sanitary arrangements, the risk of further infection was diminished to a marked degree.

Even making allowance for the personal factor in the management of households, I think the foregoing proves my contention, that the absence of good sanitary arrangements in and around houses precludes the possibility of quick and efficient removal of infectious excreta. The presence of the privy in the ground in the rear of houses is undoubtedly a

direct menace to the general health, for however well managed the privies may be, and however cleanly and careful the people themselves may be, it is impossible to prevent pollution of the ground immediately surrounding the privy in the first case, and the pollution of ground water where wells are in vogue in the second place, to say nothing of the danger of the transmission of infection by flies and dust.

The absence of good sanitary arrangements in houses, besides involving the use of the privy system, also necessarily means the fouling of ground around by house slops, refuse, etc., thus insuring a good breeding ground for any infectious matter that may be spilled thereon.

My appeal, therefore, is firstly to architects to bring these phases of the question more before the notice of the public with whom they come into contact: for they deal with a section of the people which the medical man hardly ever approaches, unless he is called in in case of illness. The architectural profession therefore has a portion, and an important one at that, of the burden of the sanitary education of the public.

As regards sanitary engineers, their opportunities of helping along this great reform come into another sphere.

I pointed out at the beginning of this paper how often epidemics of typhoid had their starting-point in polluted drinking-water; the question for engineers, therefore, resolves itself into two parts, good water supplies and good sewage disposal. Taking the latter first, efficient sewerage in a town, coupled with a process of ultimate disposal of the sewage which shall afford the smallest possible risks of fouling any drinking-water in the vicinity, are acknowledged necessities of civilization; yet, strange to say, the breach of these sanitary rules is not unknown.

The question of water supplies is also intimately associated with that of sewage and sewage disposal, especially in Canada. Here a second fundamental law comes into play. Whenever a river water which is used for drinking purposes receives sewage or sewage effluent in its course, that water ought to be filtered before being used.

I have pointed out elsewhere how in America generally there seems to be some ingrained objection to the filtration of water supplies, when such water has received sewage during some part of its course, and I am sorry to say some engineers (I won't say all) take as a working principle that if this sewage is diluted with fairly large volumes of river water, filtration is uncalled for. Partially purified sewage effluents are freely allowed and advocated by some engineers, chiefly, it seems to me, because these systems are cheap and easily get over some obstacles due to climatic conditions, etc.

The sad object lessons, of which we have now had several on the

Continent of America, besides those occurring in other countries, do not seem to have been the means of producing enlightenment on these sanitary problems.

Sanitary engineers, therefore, have their share of the burden of reform to bear as well as the architects, and I hope my appeal to these two professions will not be in vain, and that the preaching of sanitary reform will not be left to the medical profession alone.

The education of the public in these matters is a slow process, and the results are sometimes very discouraging; but if the several professions involved will only band together and make use of every opportunity which comes in their way, I am sure the reforms will be more rapid and satisfactory in the future than in the past.

PROF. NOBBS (Montreal) pointed out that the remarks of Prof. Starkey concerning architects and their responsibility in erecting structures in which the sanitary arrangements were not of an ideal standard were rather too stringent in his opinion. He called attention to the powerless position in which the architect found himself very often, by reason of the obstinacy of clients, the prohibitive cost, and, lastly, architects could not, at the present day when dealing with ordinary house property, afford the time to keep a watchful eye upon the builders and inspect every pipe laid and every joint made. The monetary returns did not warrant such an extra amount of time and trouble.

DR. PELLETIER (Montreal) also considered that it was well nigh impossible to obtain proper and efficient sanitary construction in buildings, there being so many obstacles of a private nature (*i.e.*, concerning the private individual) in the way; and he looked more to the legislation of the future for a solution to the difficulty.

PROF. STARKEY (Montreal), in reply, stated that architects must do a little more work gratuitously, like the medical profession, and he felt sure that after a time an architect would soon get a reputation for attention to sanitary details, then at that stage he would be able to get his monetary returns. As to legislation, he did not place too much reliance upon that, for he had noticed how often legislation, especially in America, was a dead letter. In Montreal, for instance, they had tons of laws and by-laws which, if enforced, gave the Sanitary Authorities all the powers they wanted; but it was notorious how inefficiently the laws were applied.

ADJOURNED DISCUSSION ON

SUGGESTED AMENDMENTS OF THE LONDON COUNTY COUNCIL BY-LAWS AS TO DRAINAGE.

At Sessional Meeting, London, October 16th, 1907.

Mr. G. M. Pettit (Kensington) was in accord with the views of Dr. Parkes and Mr. Young as to the necessity of intercepting house drains from the sewer. Choking of intercepted drains commonly arose from faulty construction of the trap, or defective fixing. He had lately seen, on an estate comprising some hundreds of houses, four-inch pipes under the houses, and in the inspecting chamber, in front, a six-inch intercepting trap, the half channel pipe expanding from four to six inches, the result being diminished velocity in the flow and deposit of solid matter in the channel or in the trap. In course of time the trap could not fail to get choked, and the nuisance would be credited to the trap and not to the faulty construction. In his opinion the by-law should be amended so as to require the drain to be of the same size from the front of the premises to the sewer. He was of opinion that "puff" pipes should be carried up the building to a safe outlet, and not allowed merely to be taken through the wall, ending, it might be, under a window or near the larder window, and this sometimes in a central well-hole, with risk of contaminating food. Complaints were frequently made by persons occupying lower or basement flats, of bad smells from kitchen-sink waste-pipes when cabbage water was discharged from kitchen sinks of the upper flats, and he was of opinion that all such wastes should discharge below the grating of the gully above the water seal, or into a properly trapped covered gully. He agreed with Dr. Parkes's views as to waste pipes of kitchen sinks in new block dwellings, but would make them applicable in the case of large existing dwelling houses made into flats. With respect to Mr. Barber's paper, he thought by-law 2 quite clear as to window and air-brick, but in his opinion the by-law was intended to apply to a single water-closet, and not to a chamber containing a number of water-closets. He himself had recently been in a new building where a number of

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The papers read by Dr. L. Parkes, Mr. J. Patten Barber, and Mr. Isaac Young, opening the Discussion, and the first part of the Discussion, are given at pages 225–250.

water-closets were grouped in such a chamber, three on opposite sides of a central passage, with one window opening into a well hole, and all so dark that artificial light was necessary. The framers of the by-law doubtless contemplated adequate light and ventilation for each water-closet. The sanitary authority should in such a case object, and so compel the owner or builder to appeal to the county council. With respect to direct approach to a water-closet from a scullery, the by-law should extend to all houses. It was especially necessary in the case of large existing houses made into a number of tenements, where the occupiers had the common use of the scullery and closet. Nuisance from offensive smells, to say nothing of indecency, was the inevitable result of such an arrangement, which was by no means uncommon. With respect to Mr. Barber's suggestion in regard to by-law 14, in many instances the work required by the sanitary authority's notice for abating a nuisance could be done, and was required to be done, in a few days or even in a few hours; and it was unreasonable to give the person liable to abate a nuisance, an excuse for postponing commencement of the work by requiring him to give a notice which was unnecessary, otherwise than as such notice would enable the sanitary inspector to supervise the execution of the work. He disagreed with proposal 9 "for fixing a time within which work found contrary to the by-laws is to be altered and made to comply therewith." The builder knew, or should know, the obligations laid on him by the by-laws, and if he failed to comply with them should be proceeded against forthwith. In practice there was great waste of the inspector's time consequent on builders' attempts to evade by-laws; and the sooner it became understood that the by-laws would be enforced, and that in case of infringement proceedings would be taken, the better it would be for all concerned.

MR. W. FIRTH (Shoreditch) said that, after all, the worst thing that could be said of the disconnecting trap was that it occasionally became stopped; the same thing applied to all traps, with the result that the inmates were inconvenienced for a short time by their own sewage. But the great danger of our system was not what was going down the drains of separate buildings, but what might come up out of the combined drains of infectious disease hospitals or private cases of infection if there was no disconnection between our dwellings and the public sewers. Taking into consideration the short life of any iron pipe when exposed to the violent action of the strong decomposing gases of the public sewers, it would be needful to have frequent periodical inspection; and was it proposed to saddle the owner of the premises with the cost of replacing the same, or was the cost to be recovered by a rate? There was another point to which he would like to draw attention, and that was the impracticability of the proposed system of ventilating the sewers by means of pipe shafts. In a house properly drained (with the fresh-air inlet at the back of the house at the far end of the drain and the outlet at the trap) the sewage left the premises before putrefaction commenced, and

the current of air induced by the flow of the liquid sewage acted on the inside of the drain pipes in the same way as a brisk wind acts after a shower of rain on the roads, absorbing the moisture and oxidising the interior of the pipes. Whereas, if the ventilating pipes were from the cesspools (miles in length) which they called sewers, giving off the gases of sewage putrefaction and disease germs from infected excreta, they were distinctly dangerous to the health of any person who might be near them.

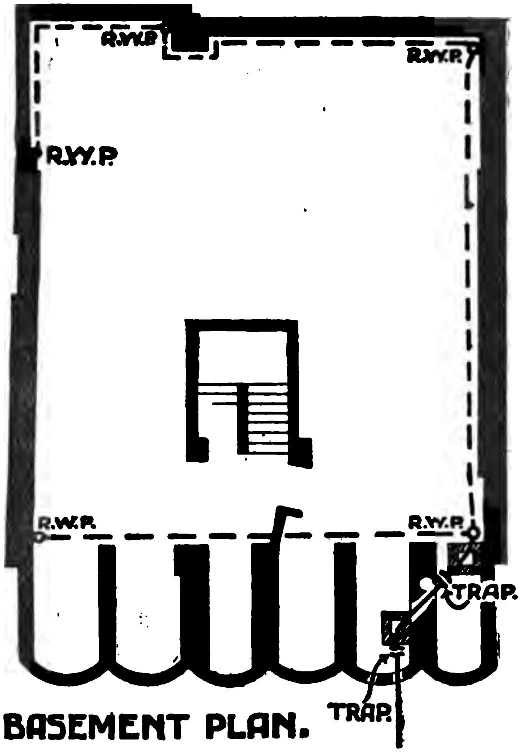
MR. T. A. GORNIOT (St. Marylebone) said that, as drainage inspector of the borough, one of the difficulties that he had met with was that of the space for the water-closets, which the by-laws said should be on an external wall with 100 feet superficial area outside, measured horizontally from the floor level; but the by-laws did not say what the width of that area should be. The only guide was the Building Acts that had a similar expression in reference to the area of wells for ventilation, stating that they should be 100 feet superficial area, and should measure 10 feet by 10 feet; whereas in the case of a water-closet in the basement the by-laws stated definitely that it must be approached from an area 5 feet wide and not less than 40 superficial feet in extent, and not covered otherwise than by a railing or grating. That, in the case of a building occupied for business purposes only, and where the whole of the building site was covered, was a hardship, and made it almost impossible for any architect to comply with. Where the various floors were occupied by separate tenants, to give the necessary w.c. accommodation also with reference to the w.c.'s on the upper floors, it would be possible to meet the requirements by having a space 1 foot wide and 100 feet long, if it was an external wall, to put a tier of closets on, which would obviously not meet the intentions of the by-laws. Therefore he contended that the by-laws should state definitely the width of that area for water-closets above the basement level, as well as for those in the basement, and make a minimum of at least 8 feet in the narrowest part, and measuring not less than 100 feet superficial. There is also a difficulty in getting rain-water pipes and bath and lavatory wastes to discharge over a gully in the open air, as now required by the by-laws in those buildings which were built over the entire site and were used only for business premises. All sorts of dodges were resorted to to get over the almost impossible regulations laid down. As the chairman had stated in his opening remarks, it would cost more to comply with the sanitary conditions than it would cost to put up the main structure of the building, and therefore be a deterrent to rebuilding and other sanitary alterations, which was not their object. He wished also to criticise a remark of a former speaker in favour of a continuous waste pipe from sinks and baths, instead of each discharging into a hopper head. Admitting that the hopper head had several disadvantages, it also had its advantages. In one case where the continuous down pipe was used in a block of flats, the flat on the first floor was left unattended for some time whilst the

flats above were fully occupied; a stoppage occurred just below the floor level of the first-floor flat, the one left unattended, the other tenants naturally, not noticing anything wrong, went on pouring their water down their sinks and using the baths above the said flat, with the result that the obstruction in the pipe was not known until the ground-floor flat tenant complained of water coming through his ceiling; when it was discovered that the first-floor flat had practically become flooded and much damage been done, which obviously could not have occurred had the system of hopper heads been used. He thought that the proper remedy for all those instances where breaches of the by-laws were necessary, owing to unforeseen circumstances, would be to give the Public Health Committee of each borough the power to sanction according to circumstances a breach of the by-laws where the object was attained, although the letter of the law was not strictly carried out.

Mr. E. B. B. Newton (Paddington), held there was very little sound argument in favour of the intercepting trap as at present used. There might be a street with a hundred houses, and a block of flats with a hundred tenements, and while the by-laws required that there should be an intercepting trap for each one of the hundred houses, yet only one such trap was required for the flats with a hundred tenements. So far from agreeing with Mr. Firth, he suggested it as more likely that the reason why London might have become a health resort had been, rather, a result of the erection of so many blocks of flats, and the decrease as a consequence in the number of intercepting traps in proportion to the number of inhabitants. He thought the by-laws had been so exhaustively dealt with by the three authors that there were few points not touched upon; but generally he was of opinion that the present by-laws needed considerable extension to meet in London, with its areas of land completely covered by buildings, such every-day difficulties as instanced by the last speaker in the case of gullies of necessity inside existing buildings; or, failing extension, that a dispensing or modifying power as to the by-laws to suit special circumstances, must be given to some authority; not necessarily the local council, but an authority such as an engineer in a position similar to that held by the superintending architect, but with an extended power of determination or settlement as a final judge or referee.

Mr. H. D. Searles-Wood (London) said that the diagram showed how rain-water drains were dealt with in the city. The dotted lines indicated suspended drain pipes. They were connected to the vertical pipe which took the rain-water at the corner of the roof, and discharged into a trap manhole. This vertical pipe also acted as the ventilating shaft. Where that system was adopted there were no rain-water drains under the basement charged with sewer gas, which might escape into the building during times of drought if the traps at the end

of the drains became untrapped. The second manhole takes the soil-drain, and the trap is the intercepting trap.



BASEMENT PLAN.

MR. A. D. PECK (Croydon) said, in relation to works of repair and reconstruction in connection with old buildings, it seemed to him that some form of discretionary power must be allowed, for, in Croydon, cases had occurred, where he felt that if he had had by-laws for that kind of work it would have been impossible to comply with them. With regard to the intercepting trap, he might say that his experience compelled him to agree with Mr. Newton, of Paddington, and join what appeared to be the minority. To have a town sweet, both round the houses and in the streets, they must, in his opinion, do away with all interceptors, and ventilate both sewers and drains through the ventilation pipes at the rear of each of the houses. With the intercepting traps, although the house drains might be comparatively free from smell, when the trap was in working order, even then there would be continual complaints of smells from manholes and other surface ventilators on the sewers.

MR. ARTHUR PERRY (Marylebone) said much could be said for and against the interceptor, for reasons already referred to, but until such time as im-

provements could be brought forward to reduce the accumulation of foul gases in the sewer, he did not support its abolition. He was of opinion that the escape of sewer gas from open ventilators in the roadway ofttimes became a nuisance and was injurious to health; and he would suggest that where practicable the sanitary authority should be empowered, upon certain considerations, to erect ventilating shafts above the eaves of premises or any available structure, particularly at any dead end. The mica valve, constructed as a fresh-air inlet, he had always looked upon as a dangerous toy, which very often within a short period had become a foul-air outlet. By referring to the geological chart it would be found that there was a good deal of clay soil in many districts, amongst which he might mention St. John's Wood, which he was personally interested in. In his opinion, the clay being drained by excavation for the Great Central Railway, and the continued vibration by motor and other traffic, somewhat accounted for the continued settlements which were taking place. In such districts as referred to, he would suggest that the option of laying glazed stoneware pipes should not be allowed, but iron should be enforced. When the stratum consisted of gravel, he was in favour of glazed stoneware pipes being laid. He would suggest that in dwellings occupied by only one family, a four-inch was preferable to a six-inch drain. In ninety per cent. of such dwellings, the crown of the drain had never been flushed, except in instances where the water-test had been applied. This often accounted for a good drain, practical for its purpose, being made a bad one as a result of such application.

Mr. J. S. Saunders (Clapham) said that, seeing opinions differed widely on many points, he thought it unwise to make the by-laws too stringent, and although it might be possible now, after some years' experience of the laws in force, to draft an ideal set of requirements, he thought the question of cost should be borne in mind; also, that as there were exceptions to every rule, there were also many cases where such ideal by-laws would be almost impossible of enforcement, and others where the cost would, and did even now, create burdens almost too heavy to be borne, especially by the small owners. He approved of the alterations proposed by Dr. Parkes, and with many of the suggestions made by Mr. Barber and Mr. Young. Mr. Young's paper showed the practical man all through. What was required was not only more perfect by-laws, but a more uniform method of application and a sympathetic interpretation. As regarded the intercepting trap, after twenty years' experience and dealing with a large number of sanitary and drainage works in the West-end of London and various parts of the country, he was convinced that its advantages far outweighed its disadvantages, especially in London; and as for the statements made that the solids were not carried through, his experience was the contrary, if the trap was properly laid and the drain properly proportioned and laid to a reasonable fall.

MR. E. B. KERSHAW (Streatham) said that when the by-laws were passed the purpose was to get a uniform system of drainage in London; if the "give and take" system was introduced the by-laws would become useless. In reference to an appeal to the superintending architect or engineer of the London County Council, if this was allowed they would require a score of those gentlemen to settle disputes, which would cause delay and annoyance. The thickness and depth of seal of manhole covers should be specified; some on the market were not thicker than a cardboard box, almost without any seal, and hardly safe to walk over. With regard to the intercepting trap, he thought this indispensable, as he had seen on many occasions pipes which had been surrounded with six inches of Portland cement and Thames ballast concrete broken through by settlement. Smell from sewers had increased since the back main line of drainage had been used, perhaps a main line of drainage into which, say, the drains of a dozen houses discharged on both sides of a road or street. On discharging into the sewer in the road a good percentage of the sewage remained; the only other junctions into the sewer are the road gullies; in dry weather very little water discharged from them into the sewer to help the flushing, and this caused the smell to rise up the next ventilator from the stagnant sewage.

MR. DAVID GRUNDY (Westminster) did not think any discretionary powers ought to be provided in framing by-laws, as advocated by many speakers; more, it would be fatal to uniform administration if difference of opinion arose or was possible to arise as to what was the meaning conveyed in any one law. Further, if the definition thereof had to be submitted to some person selected to decide, it would be worse, because each superintending engineer could only give his opinion, and the number of arbitrators required would be almost as numerous as those whose decisions were called into question; the result would be chaos in place of uniformity. The choking-up of the interceptor trap arose from the fact that the water-force in the usual flushing systems was not adequate to carry the solids from the water-closet to and through the interceptor.

MR. T. H. ELMS (Kensington) begged to offer a few suggestions concerning certain points of the drainage by-laws, which the papers introducing the discussion did not seem to have touched upon. In his opinion the interceptor was a great protection. If it were done away with, nearly the whole of the sanitary fittings now in use would be useless and unsafe. What protection would there be, even supposing the house drains were water and gas tight, if a gully or trap were fixed, say, in a front area near a window, and the seal of the same dried up through evaporation or dry weather? Instead of having the sewer gas in the centre of the road, where it would be diluted by pure air, it would be immediately under one's nose. All traps, gullies, and w.c.'s would have to be made with deeper water seal, and flushing apparatus of greater

capacity to cleanse the same. Interceptors, like other things, required selecting. It was a mistake to fix one of deep-water seal if the house drain had little fall. In nearly every case stoppage was caused by the fixing of unsuitable traps, bad fixing of good ones, large size drains with small gradient and insufficient flushing. Four-inch drains were allowed to have a three-and-a-half-inch ventilating pipe. Where the soil pipe acted as the ventilating pipe it should be four inches in diameter to prevent air compression. He entirely agreed with what Dr. Parkes had said with regard to all wastes being made to connect to a vertical ventilated waste pipe by means of junctions, and that all traps be fitted with anti-siphon pipes connected into a vertical main anti-siphon pipe; but the gully into which the main waste pipe discharges should be sealed. Of course, there was a drawback with a pipe taking wastes by junctions should it become choked; but even that could be overcome if the anti-siphonage pipes from the waste traps were connected to the vertical anti-siphonage pipe slightly lower than the tops of baths, sinks, etc., and if the main anti-siphonage pipe were carried down and connected into the sealed gully at ground-level.

The Chairman (Sir Shirley Murphy), in proposing a vote of thanks to the readers of the papers, said that the suggestion, which had been frequently made, that the by-laws should provide for the sanitary authorities to exercise a discretionary power in the way they should be enforced, could not be acted upon. It would be necessary to apply to Parliament for powers for this purpose. The question arose chiefly in respect of buildings, the site of which was entirely covered. He would point out that when a building was designed, the requirements of the by-laws should be considered at the same time, and he did not think it wise to assume that there was a right to cover the whole site, and that by-laws which conflicted with the desire to do so must, in such circumstances, be abandoned. The papers, and the discussion to which they gave rise, had been fruitful in suggestions for the improvement of the by-laws. Those by-laws had undoubtedly been of great use in London; and there was no doubt that when they were amended the points that had been raised, and which were based upon a number of years' experience of their actual working, would be carefully considered.

Dr. Louis C. Parkes (Chelsea) agreed with the chairman that it would not be possible in by-laws, the breach of which involved the infliction of a penalty, to provide for any dispensatory powers. The officers of sanitary authorities could, on their own initiative, dispense with or alter certain requirements when found impracticable or undesirable, but such exercises of dispensatory powers should be recorded in books, which were open to inspection by members of the sanitary authority. The intercepting trap could not be dispensed with until all the sewers of local sanitary authorities were well laid, well graded, and self-cleansing. When such a desirable consummation had been reached, and the

genus sewer rat had ceased to exist, then would be the time to reconsider further the abolition of the house-drain intercepting trap. In advocating iron drains it should be remembered that the length of life of such drains was unknown. Corrosion of iron drains commenced after a shorter or longer period from their being laid down, and it was undesirable to bind down owners of property and builders to one kind of material. In districts where there were settlements, from clay subsoil or other causes, the attention of builders should be called to the desirability of using very strong drains, and they would usually choose the iron drain to safeguard their own interests. The liability to flooding of empty flats when the sink pipes were connected with continuous wastes could, as one speaker pointed out, be easily met by carrying the lower end of the anti-siphonage pipe to empty under the grating of a gully. It was most desirable that open hopper heads receiving foul waste water in blocks of mansions should be avoided.

MR. J. PATTEN BARBER (Islington), in reply, thanked the meeting for their appreciation of his paper, which had not been prepared with a view to destructive criticism of the existing by-laws, but with the object of showing where the difficulties in controlling drainage and sanitary work by means of the by-laws lay, and of suggesting improvements whereby the occasions for difficulties and misunderstandings might be avoided. He thought that most of the troubles which were experienced with disconnecting traps, and with any other part of the drainage system of a house, arose from the ignorance and carelessness of the persons for whose benefit they were provided. If the drains were occasionally flushed by a few pailsful of water, and if the misuse of the drains were avoided, stoppages of the traps and the drains would not occur. There were people so careless and slovenly that they would put out of order any appliance, whether simple, like a drain-pipe, or complex, like a trap or a gully; but it could not be counted against the intercepting trap that it became choked through the misuse of the drains by careless people. Some would not take the trouble to clean the gulleys belonging to their premises, nor to fill them with water during long drought; they neglected the simple precautions which were necessary to their living in good health and comfort. As people became better acquainted with the simple methods which should be adopted for the purpose of keeping the drains and sanitary fittings of their houses in order, they would regard the regular flushing and cleansing of these appliances as necessary as the cleansing of the floors and other parts of their dwellings. The influence of sanitary inspectors in carrying out their duties had, in these days, an educational effect, so that there was a reasonable hope that people would learn from them the necessity for systematic attention being given to drains and other appliances. He had not found that the use of intercepting traps caused an increase of smell from the sewers. There were about 110 miles of sewers under his charge in the borough of Islington, and although the number of intercepting traps had increased

enormously during the past ten years, the sewers had never been so free from foul-smelling gases; it was very seldom that a complaint was received of smell from any of the sewers. One of the speakers thought it inadvisable to have a by-law empowering the sanitary authority to fix a time within which work that had been done contrary to the by-laws should be altered so as to comply therewith; and that proceedings should be taken on the discovery of a breach of the by-laws. That was too harsh and precipitate; it was wiser to give notice to the offender and request him to alter the work, even if the request had to be repeated. Legal proceedings should be avoided if possible, and taken only after persuasion had failed. Mr. Grundy had pointed out that if the suggestion to fix a minimum height of four feet for the bottom of the flushing cistern above the flushing arm of a w.c. were adopted, the use of certain cisterns which did not depend upon so great a head of water for effectually flushing the receptacle would be prohibited. That contention was correct, and an exception would have to be made in the case of cisterns which discharged their contents by means of a large pipe quickly into the receptacle and gave it a very effective flushing. The bottoms of such cisterns were often on a level with the closet seat, and the discharge of the entire contents of the cistern took place with great rapidity and without noise. He would certainly not wish to make any alteration in the by-laws which would prohibit the use of these very efficient cisterns. He could not agree with Mr. Newton's suggestion that deviations from the by-laws should not be made unless sanctioned by the superintending architect. The borough engineer was competent to advise his committee as to the advisability of sanctioning such deviations. In his practice it was a rule that no deviations from the requirements of a by-law should be made unless it was impossible to carry out those requirements, and then a deviation was not allowed unless it had been sanctioned by a Committee of the Borough Council, which dealt with drainage matters. In that manner unauthorised irregularities were prevented, and the officer responsible for the carrying out of the by-laws was safeguarded from accusations of having failed to insist upon their observance.

Mr. Isaac Young (Battersea) said there did not appear much to answer, as the views he had expressed appeared with practically only one exception to have been favourably received. The one exception had been in relation to the intercepting trap, and he was pleased to find that, excepting in two or three instances, all the speakers in the discussion were favourable to the retention of the provisions for these appliances in the by-laws regulating drainage. With regard to the present by-laws, they were agreed that amendments were necessary as the result of six years' experience, but all the difficulties could not be seen, and in whatever way it might be decided to amend the by-laws, it would be found that cases would arise in which the by-laws could not be applied to the letter. With a view to representation being made to the London County Council in what particulars amendments should be made, he suggested that that meeting

refer the matter to a Committee of the Institute to prepare draft proposals in order that the deliberations upon the question might not end with the excellent discussion that had taken place. He had found upon many occasions that water-closets provided with the requisite open space adjoining were within a few months or years built in and over, leaving them in many cases without any open space; and that must be guarded against as far as practicable in future legislation with regard to the by-laws. As pointed out in his paper, the London Building Act appeared to have been lost sight of when the by-laws were framed, otherwise provision would surely have been made for dealing with the drainage of buildings whenever the site was entirely or largely built over. During the discussion no substantial arguments had been brought forward against the more general use of iron pipes and fittings for drainage, and he was fully convinced of their advantage and superiority over stoneware pipes, and also that they were not more costly than stoneware if the embedding of them in concrete was omitted, as suggested in his paper. The arguments used against the employment of intercepting traps, although deserving of every consideration, had been as usual weak in the extreme, and might generally be summed up as having been formed from observations made where unsuitable traps had been used or the traps improperly fixed. He was every day more confirmed in his views as to their utility and necessity. The main and substantial objection to intercepting traps was that they prevented the ventilation of sewers through the house drains; but it seemed to be forgotten that houses were not built over sewers, and the main object of interception was to prevent the pollution of the soil of the site of the house, and to preserve the air of the dwelling from sewer emanations. In answer to those who advocated sewer ventilation troughh house drains, he would say that it was constantly the practice to close down the 144 sq. in. of surface ventilating gratings to sewers and provide in place thereof a six-inch column, or about one-fourth the ventilating area of the surface grating. Columns were not all-efficient substitutes for the surface vents: they should be provided as supplementary, and not in lieu thereof; and in addition he begged to throw out the suggestion to their surveyors and engineers that still something further was needed; heat in the form of lamps connected to columns had been found useful; but he was of opinion that they should go a step further in making use of electricity, which had proved in so many ways an advantage. He would like to see exhaust electric fans attached to some of the principal ventilating columns, and he believed if that were done, not only would there not be sewer emanations from the surface gratings, but these would at all times be admitting fresh air, and the sewers would be thereby more efficiently ventilated. He agreed that flushing and ventilating were both necessary in respect of sewers. The suggestions of Mr. Gorniot were both valuable and practicable.

GENERAL NOTES.

THE FOURTEENTH INTERNATIONAL CONGRESS OF HYGIENE AND DEMOGRAPHY.

By SIR SHIRLEY MURPHY.

The Fourteenth International Congress of Hygiene and Demography was held in Berlin, and lasted from the 23rd to the 29th of September, a large portion of the members of the Congress proceeding on the 29th to Hamburg, where, on the following day, opportunity was given for seeing the many matters of interest which are associated with the sanitary administration of that important port.

The Congress was divided into eight sections:

I. Hygienic microbiology and parasitology;
II. Dietetic hygiene, hygienic physiology;
III. Hygiene of childhood and schools;
IV. Professional hygiene and care of the working classes;
V. Combating infectious diseases and care of the sick;
VI. (*a*) Hygiene of dwellings, townships, and waters;
(*b*) Hygiene of traffic, life saving;
VII. Military, colonial, and naval hygiene;
VIII. Demography.

With so extended a programme, it was obviously impossible for a member to do more than attach himself to a particular section, or to select particular subjects in different sections, and devote his attention to them. In this matter he was greatly assisted by the fact that he was provided with an excellent abstract of every paper read presented in three languages, German, English, and French; and the daily issued Congressblatt informed him, not only of the subjects to be discussed on the day in question, but gave a brief account of what had occurred in each section on the preceding day.

In Section I., the principal subjects of discussion were the etiology of tuberculosis, the bacilli of the typhoid group, the cocci of meningitis and similar bacteria, the etiology of syphilis, pathogenic protozoa and spirochaetae, insects as carriers of diseases, the methods of testing sera, and modern methods of immunisation. These subjects were specially dealt with by Arloing, Flügge, Loffler, Metchnikoff, Hewlett, Nuttall, Ehrlich Roux, Calmette, and other well-known investigators. The preservation of food-stuffs, and the necessary minimum of proteids, entered largely into the discussion in Section II. The care of infants, milk supplies, school physicians, and overwork were among the subjects considered in Section III. Section IV., in the main, related to industrial diseases and their methods of prevention. In Section V., disinfection and preventive inoculations were discussed, together with meat inspection. The titles of the other sections sufficiently indicate the matter dealt with. In Section VII. Ronald Ross and Ashburton Thompson contributed valuable papers. In the middle of the week a plenary meeting was held, in which Dr. H. S. Haldane, of Oxford, gave an address on some recent investigations in the hygiene of subterranean and subaqueous work; Dr. Chantemesse, of Paris, on the serotherapie of

tyhpoid fever; and Dr. SCHATTENFROH, of Vienna, on the principles of the hygienic protection of water supplies.

It is impossible here to enter on any detailed discussion of the papers which were read, or the conclusions which were arrived at; but it will interest English reader to know that no effort was made to maintain the position of Koch on the question of the amount of risk to man from bovine tuberculosis, and that the views expressed on this subject were not different from those at which the reader of the report of the English Commission necessarily arrives. Dr. H. HALDANE's paper contained material which needs to be studied by all concerned in subaqueous and subterranean works, particularly as it tends to lessen the difficulties and expense which now attend such undertakings.

An important feature of the Congress was a comprehensive and well arranged exhibition. The Imperial Board of Health, the Institute of Infectious Diseases, the Hygienic Institutes of Berlin, Dresden, and Frankfort, the Medical Department of the Prussian War Office, and various Universities had exhibits. The exhibition of statistics, including those relating to insurance, infant mortality, and other subjects connected with hygiene were especially good. Other exhibits were in groups, relating to infants' and children's hygiene, tuberculosis, infectious diseases, bacteriology, water supply and sewage, hospital buildings and disinfection, industrial diseases, heating and lighting, cremation, and a large number of scientific apparatus.

The Congress was largely attended, the number of those taking part in it probably amounting to some 4,000 or 5,000 persons. It was admirably organised, and nothing could have exceeded the careful regard which was had for the comfort and enjoyment of the members, and the completeness with which they were afforded the opportunity of making themselves acquainted with all Berlin and Hamburg could offer to those interested in hygiene and demography. The municipal and personal hospitality in both cities was of the most generous kind.

NOTES ON LEGISLATION AND LAW CASES.

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SEWERS.—*Right to support—Mines and minerals—Adjacent lands—Public Health Act, 1875 (38 & 39 Vict. c. 55), ss. 15, 16, 175, 176, 308; Public Health Act, 1875 (Support of Sewers) Amendment Act, 1883 (46 & 47 Vict. c. 37), ss. 2, 3, 4, 5.*

In this case Parker J. said that the rights of the corporation, under the conveyance, to subjacent or adjacent support depended on the principles of the common law, and not on statute. It was doubtful whether the umpire's award of 1878 could have been made except by agreement; but *in re Dudley Corporation* (1881) 8 Q.B.D. 86 showed that the umpire ought to have regarded the fact that the Public Health Act, 1875, conferred on the corporation both the subjacent and adjacent right to support, and there was no evidence that he had not done so. The right to subjacent and adjacent support to the land conveyed was not disputed, and the Public Health Act, 1875, gave a right to subjacent

support of the outfall sewer, and to support from adjacent land, so far, at any rate, as that land was in the same ownership as the land in which the sewer ran. The outfall sewer and other sewage works were both "sanitary works" within the Act of 1883, and the "Sanitary Act" was, as regarded the outfall sewer, the Public Health Act, 1875, and as regarded the other works, either that Act or the Act which it replaced. Sect. 3 of the Act of 1883 incorporated ss. 18 to 27 of the Waterworks Clauses Act, 1847, retrospectively, with modifications, thus excluding common law principles where the sections were applicable, and substituting a "mineral code," under which the sanitary authority had, after notice, an option to acquire minerals within a certain distance, and so obtain support for the sewage works. If the option was not exercised the minerals could be worked as if the Sanitary Act had not been passed. By s. 4 of the Act of 1883, "except as in this Act provided," the local authority was not by reason of the Sanitary Act to be deemed to have acquired or to be bound to compensate for the right to support, and nothing in the Sanitary Act was to be deemed to subject the owner of the minerals to any liability for damage caused by properly working the minerals. That section referred to s. 5, and the first paragraph of that section did not need consideration. The second paragraph was as follows: "Where any right of support has been acquired before the passing of this Act by a local authority in respect of any sanitary work and no compensation is at the passing of this Act recoverable in respect of such right, nothing in this Act shall be construed to apply to the work in respect of which such right has been acquired, or operate to deprive the local authority of such right or to entitle any person to any compensation in respect thereof, to which such person would not have been entitled if this Act had not been passed." The sanitary works to which this clause applied were altogether taken out of the Act. The corporation had prior to the Act acquired rights of support for this sewage work and the outfall sewer, and no compensation was then recoverable; for compensation for the works in the land conveyed had been paid before the Act came into operation, and the award with reference to the outfall sewer covered everything. There must be a declaration that according to the true construction of s. 5 of the Act of 1883, the former sections had no application either to the sewage works or to the outfall sewer, and the contention of the plts. failed.

JARY v. BARNSLEY CORPORATION. Parker J. (1907) W.N., 184. July, 1907.

WATER.—*Supply for domestic purposes—Water for motor-car used for profession of Physician and Surgeon—Waterworks Clauses Act, 1863 (26 & 27 Vict. c. 93), s. 12.*

Water supplied to and used by a medical man for washing a motor-car and for other purposes in connection therewith, the motor-car being used by him for the purposes of his profession or business of a physician and surgeon, is water supplied for domestic purposes within the meaning of s. 12 of the Waterworks Clauses Act, 1863.

HARROGATE CORPORATION v. MACKAY. Div. Ct. 611. 2 K.B., Aug., 1907.

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DISCUSSION ON

THE RECENT REPORT OF THE ROYAL COMMISSION ON TUBERCULOSIS.

Opened by A. M. N. PRINGLE, M.B., C.M., D.P.H.,

Medical Officer of Health, Ipswich.

(MEMBER.)

At Sessional Meeting, Ipswich, October 19th, 1907.

THE subject which we are to discuss to-day is the relationship between human and bovine tuberculosis, and the basis of discussion is the Report of the Royal Commission on Tuberculosis.

Prior to 1901 it was almost universally held that human and bovine tuberculosis were manifestations of one and the same disease. In that year, however, Koch announced at the meeting of the International Congress on tuberculosis, held in London, that in his opinion "human tuberculosis differed from bovine tuberculosis, and could not be transmitted to cattle," and further "that the extent of infection by the milk and flesh of tubercular cattle was hardly greater than that due to hereditary transmission, and therefore he did not consider it advisable to take any steps against it."

Koch's conclusions were based on the results of experiments in which he inoculated the bacilli of human tuberculosis into cattle, with the result that he produced either no disease at all, or at the most a limited local tuberculosis with no generalised systemic infection. He was also of the opinion that primary infection of the human subject through the intestinal canal was of extremely rare occurrence.

As a result, in August, 1901, a Royal Commission was appointed to investigate these views and pronounce upon their truth or falsity.

The second interim report of this Commission has now been issued.

I do not propose to enter into an exhaustive analysis of the voluminous work of the Commission. For such a procedure there is no time, and, if I may say it without offence, we are not all in a position to appreciate the precise meaning of much of the work done. To do so it is necessary to possess a sound knowledge of tubercular disease in its clinical manifestation, and a close acquaintance with bacteriology. I must, however, point out that as the result of innumerable observations by many skilled observers in all parts of the globe, it has been shown that there are two great types of mammalian tuberculosis which are respectively entitled human and bovine tuberculosis. In these types the tubercle bacilli differ both in their cultural characters and in their degree of virulence. Bovine tubercle bacilli are found to be slightly different in their microscopical appearances from human bacilli; further, their growth has been shown to be not so luxuriant on artificial media. The resultant of these differences is therefore that human bacilli are a little longer and a little thinner than bovine bacilli, and that they grow more luxuriantly on culture media. These are, however, not differences in kind, but only in degree. By appropriate methods the Commissioners were able to establish a classification into grades, based on the growth characteristics of the bacilli. The result shows that although there are considerable differences between those that flourish most easily on artificial media and those that flourish least easily, nevertheless these two grades are connected by a series of intermediate forms which unite the whole group.

As to the effects produced by the growth of both human and bovine tubercle bacilli in the animal body, the results obtained show decisively that we are again face to face with a difference in degree but not of kind. The tubercular lesion, whether set up by a bovine or human bacillus, possesses certain clear and distinct features which are characteristic of the effects of the growth of the bacillus in the body. Whether the lesion is that associated with an acute generalised tuberculosis or with a limited retrogressive tuberculosis, the lesion is always the typical lesion of tuberculosis.

We are now in a position to go a step further. The Commission found that when bovine tubercle bacilli were inoculated into bovine animals in sufficient dose, bovine tuberculosis was always produced, proving of course the causal relationship between the bacillus and the disease. The effects however varied in degree. In some cases a rapidly fatal acute generalised tuberculosis was produced. In other cases only a limited retrogressive disease. Yet, again, there were cases of an intermediate character. We have no time to discuss the reasons for these variations.

Again, a number of calves were fed on tuberculous milk. In one case acute generalised tuberculosis resulted. In the other cases only a limited retrogressive tuberculosis was produced, affecting the intestine and the intestinal glands (mesenteric, etc.), and in one case the pharyngeal glands.

In rabbits, guinea-pigs, and pigs, bovine bacilli produce a general tuberculosis by inoculation. Not only so, but feeding pigs with tuberculous milk rapidly produced tuberculosis. In monkeys and the anthropoid apes generalised tuberculosis was readily produced, not only by inoculation, but also by feeding with tuberculous milk.

So far as is known, the bacillus of bovine tuberculosis is always the bovine bacillus. In pigs also, so far as is at present known, the bacillus is always of the bovine type. It may, indeed, be taken as a fact that practically the whole of the tubercular disease existent in the animal kingdom other than man is due to the bacillus of the bovine disease.

The bacillus of bovine tuberculosis is thus seen to be a highly virulent organism, capable of producing its full effect on a large number of animals other than the bovine species. This is a most important and essential fact, which has a powerful bearing on the question of the power of the bacillus to produce tubercular disease in man as well as in other animals. I may add in this relation that accidental inoculation of man with the bacillus of bovine tuberculosis has resulted in the establishment of tubercular disease (Ravenel).

Let us now consider the corresponding experimental facts in connection with the bacillus of human tuberculosis. It has been already indicated to you that the human bacillus exhibits differences from the bovine bacillus in its morphological and cultural characters. I must again remind you, however, that there are intermediate forms, both morphological and cultural, which closely connect the different forms of human tubercle bacilli with one another, and also with the bacilli of bovine tuberculosis, so that it is possible to construct a series which clearly connects the different members of the whole group into one family.

The human tubercle bacillus, when injected in sufficient dose into the bovine animal, does not produce a general tuberculosis, but only a limited retrogressive disease. Some experimenters, notably Sheridan Delépine, have however succeeded in inducing general tuberculosis in the bovine by the injection of human tubercle bacilli, but these results are exceptional. There is thus a distinct difference in the action of bovine and human tubercle bacilli towards the bovine animal. I again beg of you to note, however, that this is a difference of degree but not of kind. The lesion

produced is a typical tuberculosis lesion, though of a limited and retrogressive character.

When the bacillus of human tuberculosis is inoculated into other animals, we get the following results:—

In guinea-pigs a generalised progressive tuberculosis is easily produced; in monkeys we get the same effect, and also in the anthropoid apes. In these animals the lesions are thus quite comparable with the effects of the inoculation of the bovine bacillus. In the case of pigs, however, the bacillus of human tubercle does not produce general tuberculosis, thus differing from the effects of the bovine bacillus. In the case of the rabbit, also, the effect of the injection of the human bacillus is a limited retrogressive tuberculosis, differing, therefore, very distinctly from the general tuberculosis so readily produced in them by the injection of the bacillus of bovine tuberculosis.

We may now summarise the effects of the inoculation of the bacillus of human tuberculosis, and we find, as a result, that whilst in the guinea-pig and monkey it readily produces the same lesions as the bacillus of bovine tuberculosis and in the same degree, it cannot do so in the case of the rabbit, the pig, and the bovines. In these bovines the effects are to produce a limited retrogressive tuberculosis. We are thus evidently dealing with an organism of much lower virulence than that of bovine tuberculosis. We are dealing, in short, with a bacillus which is at the opposite end of the tuberculosis grade from that of the bacillus of bovine tuberculosis, a fact which is further demonstrated both by its morphological and cultural characteristics.

Those of you who have insufficiently studied this complex problem will be inclined to conclude that the Report of the Royal Commission establishes the fact that though these two types of bacilli may belong to the same species, yet they are so different in their pathological effects that the bacillus of the human disease is, from the point of view of the reciprocal infection of man and animals, to be regarded as exclusively (for all practical purposes) the cause of human tuberculosis, and that therefore Koch's dictum was true.

This view would be correct and logical but for one damning fact. The researches of the Royal Commission have, I think, conclusively shown that all cases of human tuberculosis are not caused by the bacillus of human tuberculosis. On the contrary, they have conclusively shown that there is a certain (by no means inconsiderable) percentage where the bacillus which has caused the disease in the human being has been found

to possess the morphological characteristics, the cultural characteristics, and the disease-producing effects of the bacillus of bovine tuberculosis. In this proportion of cases the bacilli found were absolutely indistinguishable from the bacilli of bovine tuberculosis. The bacilli were, in other words, the bacilli of bovine tuberculosis growing in the human body, and producing in it the whole of those features which we identify with the characteristics of human tuberculosis.

I have already indicated to you that the bovine bacillus can produce the typical lesions of tuberculosis in animals other than the bovine animal. These results can be produced with such ease and certainty as to leave no room for doubt that the bacillus of bovine tubercle has a definite and distinct power of causing the disease in those animals. I believe that the researches of the Commissioners have shown that the human animal must be added to this list, and that the method by which the disease is conveyed from the bovine animal to the human is the consumption of tuberculous milk, or, in other words, the milk from a cow infected with tuberculosis.

In no fewer than 14 out of 60 cases of human tuberculosis, the bacilli of which were investigated by the Commissioners, it was found that the bacillus which caused the disease was identical in all respects with the bacillus of bovine tuberculosis. In 13 of the cases the bacilli were obtained either from diseased cervical glands, or from the lesions of primary abdominal tuberculosis. These two sites are those which one would expect with the incidence of disease associated with ingestion. It is also to be most particularly noted that almost all these infected tissues were obtained from the diseased tissues of children; in fact, all (10) the abdominal cases were of children.

We are thus led by our investigation to accept as an established fact that bovine tuberculosis can infect the human body and that the particular organs affected are those into which the bovine tubercle bacilli are introduced by the process of ingestion. In other words, we can definitely state the proposition that tuberculosis can be set up in the human body by the ingestion of food containing bovine tubercle bacilli: the disease produced is bovine tuberculosis implanted in the human body.

Let us recapitulate. It is now possible to enunciate the following propositions, always bearing in mind that we are considering the interrelation of bovine and human tuberculosis only:—

1. There are two distinct types of tubercle bacilli, the bovine and the human.

2. The bovine bacillus is one of high virulence, possesses certain distinct differences in its morphological character from the human bacillus and grows with comparative difficulty on artificial media.

3. The human bacillus differs from the bovine bacillus in that it is longer, thinner, and grows more luxuriantly; it is also of relatively lower virulence.

4. There are, however, connecting forms which clearly indicate that these two types belong to the same species, and that these differences are merely modifications of their characters, not different characters.

5. The bovine bacillus produces the typical tuberculosis lesion in many animals other than the bovine; this can be seen easily in the pig by feeding young pigs on tuberculous milk. In monkeys and anthropoids typical tuberculosis is produced.

6. The human bacillus produces the typical tuberculosis lesion in several animals, *e.g.*, the guinea-pig and monkeys. It can infect bovines, and can produce in them the typical tuberculosis lesion, though usually in a limited retrogressive form.

7. The differences between these bacilli are thus differences of degree, but in no sense differences of kind.

8. In a certain proportion of the cases of human tuberculosis the bacillus was the bacillus of bovine tuberculosis. It was an organism in which the morphological characters, the growth characteristics, and the pathological effects on bovine and other animals, were in all respects identical and indistinguishable from those produced by bacilli taken from a pure bovine source. The Commissioners state their opinion on this point in no uncertain words; they say "that the human body can be infected by bovine tuberculosis."

The vehicle of infection is stated to be probably tuberculous milk. From my point of view it is impossible to escape the conclusion that the milk of tuberculous cases is a grave menace to the health of those consuming it.

The great consumers of milk are the children. It is a suggestive and menacing fact that in ten cases of abdominal tuberculosis investigated by the Commissioners, the bacillus present was found to be the bacillus of bovine tuberculosis. There can, therefore, be no question that the milk of tuberculous cows ought not to be supplied for human consumption. The Commissioners state their opinion "that cows' milk containing bovine tubercle bacilli is clearly a cause of tuberculosis, and of fatal tuberculosis in man." They further state that "the milk coming from a cow suffering from tuberculosis ought not to form part of human food, and, indeed, ought not to be used as food at all." Again, they say that "these results

clearly point to the necessity of measures more stringent than those at present enforced being taken to prevent the sale or the consumption of such food."

It is now competent to inquire whether, as a matter of practical fact, tubercle bacilli are found in cows' milk in the course of its delivery to the consumer, in other words, whether tuberculous milk is actually sold to the public?

If we turn to the annual report for 1906 of the medical officer of health for Manchester, the following remarkable facts are brought to light:—

677 samples of milk were taken and subjected to bacteriological examination. Of these 649 were taken at the railway stations in the course of delivery. The remaining 29 were obtained from farmers whose milk is brought into the city by cart. The number of farms included in the taking of these samples was 542; the number of cows 12,918.

Of the milks tested by Prof. Delépine 42 were found to contain the tubercle bacillus, giving a percentage of 7·7 farms sending tuberculous milk.

The tuberculous milk samples were followed to the farms from whence they were obtained, with the result that 30 cows on the farms were found and proved to be suffering from tuberculosis of the udder. Of these 30 cows 21 were slaughtered in the presence of the medical officer; in 8 of these the entire carcase was passed as fit for food; in 3 instances portions of the carcase were passed, and in 10 the entire carcase was condemned.

In the remaining 9 cases the disposal of the cows could not always be ascertained.

To further illustrate this point I quote the following table, also from Dr. Niven's report.

Year.	Number of farmers' milk tested.	Number found to cause tuberculosis in the experimental animal.	Percentage of farmers sending tuberculous milk.
1901	272	27	9·9
1902	345	36	10·4
1903	329	45	13·6
1904	318	29	9·1
1905	565	47	8·3
1906	542	42	7·7

These figures, in the light of what has been said before, can only be viewed with grave concern, and conclusively prove that tuberculous milk is actually sold for human food in no inconsiderable quantity. Further, tuberculosis has been found to attack the udder of the cow in about 5 per

cent. of the cases. Thus we are face to face with a condition which calls for strenuous and united action on the part of all who have the welfare of the nation at heart.

I ask you to recollect that the abdominal cases do not represent all the cases of human tuberculosis which are due to the ingestion of bovine tubercle bacilli. There is gradually accumulating accurate clinical evidence which goes to prove that some cases of the pulmonary tuberculosis of adults are but the belated exhibition of the effects of a tuberculosis (abdominal) acquired in childhood. Therefore the extent of the danger may be greater than that indicated by the incidence of abdominal or other tuberculosis associated with the alimentary tract.

I believe that we are rapidly approaching the day when united action will be taken to stamp out the greatest curse to which humanity is heir. Tuberculosis accounts for more than 10 per cent. of the deaths which occur in this country. The yearly toll which the disease levies on the people of this country reaches the appalling total of 60,000 deaths. The mere fact of this terrible death roll represents only one aspect of the question. Consider the individual suffering which the disease entails, the wretched homes with no prospect but the workhouse when the sufferer is the wage earner and is no longer fit to work; consider the enormous economic loss which the disease occasions upon the community. I ask you to consider these hints from the point of view of an annual death-roll of 60,000 persons.

I ask you to consider a fact based on irrefutable evidence, that the various manifestations of tuberculosis are preventable. There are many eminent observers who, viewing the enormous fall (nearly 50 per cent.) in the tuberculosis death-rate during the last 60 years, prophesy the extinction of the disease within 50 years.

I agree with this view with one reservation, that is, that the problem be attacked with a single-minded purpose to secure the end in view. From the point of view under consideration, a determined effort must be made to secure the eradication of the disease from amongst cattle. That this can be done is proved by the fact that it is done, and that successfully, in certain parts of the kingdom. It is therefore futile to bring forward the statement that the disease cannot be eradicated.

I can understand the point of view of the man who says the cost is too great. But is it? Consider the fact that in the last seven years 88 persons have died from pulmonary consumption in the Ipswich workhouse. Consider that these were with very few exceptions wage-earning adults. Consider the number of other inmates of the workhouse who are there

because the wage-earners are no longer fit to support them. Consider the heavy economic losses to the community indicated by the fact that 10 per cent. of the total death-rate of the Borough of Ipswich is due to the preventable disease of tuberculosis. I ask you to consider these things, and I propound the question whether it is not common sense to spend money in preventing these people from catching the disease rather than in the fatuous policy of allowing the disease to go unchecked in our midst, and then spending double the money in dealing directly with its ravages.

From our point of view to-day we must begin with the source of the disease. One of the sources is the milk of tuberculous cows. We must, therefore, begin with the cattle. How that is to be done does not come within the limits of my paper. I hope that those who discuss this question will indicate the lines generally recognised as being available.

In conclusion, I ask you to recollect that whilst tuberculous milk is responsible for a proportion of the cases of human tuberculosis, the vast majority are due to infection from a pre-existing human source. The proportion of fourteen out of sixty due to a bovine source is probably too high. Even admitting this, however, sufficient proof has been adduced to render a strenuous campaign against tuberculous milk an imperative necessity.

DR. W. G. SAVAGE (Colchester) remarked that Dr. Pringle started with the proved fact that tuberculous animals can and do set up tuberculosis in human beings. Two possible sources of danger from animals must be considered, tuberculous meat and milk containing tubercle bacilli. What was the relative danger of these two forms of infection? As regards tuberculous meat, the fact that the meat was not eaten raw but was subjected to cooking at once served to minimise the danger from this source. He was aware that the temperature of the interior of a joint was not always sufficient to kill the tubercle bacillus, but infection in such a situation was not a great one. Tuberculosis was emphatically a question of dosage, and in view of this fact, and also that adults were not nearly so susceptible to intestinal infection as children, it was his opinion that the danger of acquiring tuberculosis from meat was small. Turning to the other source of danger, milk containing tubercle bacilli, the question was essentially different. Milk was usually consumed raw, it might contain very numerous tubercle bacilli, and it was especially the food for young children, persons very susceptible to infection from the alimentary tract. From the administrative point of view, it was important to clearly decide whether all cows affected with tuberculosis could infect their milk. Theoretically, we must say yes; but as a matter of practical administration, he was inclined to say no. That is, from a scientific point of view, he was aware that milk might contain tubercle

bacilli, and yet the cow yielding it might show no evidence of tuberculosis of the milk-producing organs. For example, tubercle bacilli might gain access from infected dust, from the intestinal excreta of tuberculous animals, etc. Also, the careful work of Mohler and others has shown that tubercle bacilli may be found in milk, and may set up tuberculosis in experimental animals, when derived from cows which have no clinical or even microscopic signs of tuberculosis of the udder. As practical administrators, he was however of opinion that unless the udder was affected the danger was sufficiently small to be neglected, at least for the present. This was so because the tubercle bacilli gaining access in this way were very few probably, and, as he had already mentioned, tuberculosis was essentially a question of dosage among other things. Also, they must remember that tubercle bacilli do not multiply in milk like diphtheria bacilli, for example, so there was no question of one or two gaining access, and by the time the milk was consumed multiplying to millions. This was a matter of great public importance, since about 25 per cent. of cows suffer from tuberculosis, while only 3 to 4 per cent. of tuberculous cows show tuberculous udders. Therefore, from a practical administrative point of view, he felt that what we had essentially to guard against to prevent infection from animal to man was to take steps to prevent the milk from these (about one per cent.) cows with tuberculous udders gaining access to the milk supply. How is this to be carried out? In the first place, the present law was insufficient and inadequate. It should be obligatory for the cowkeeper to report *all* cases of udder mischief to the local authority, and for the latter, through their properly appointed officers, to decide how far the conditions found were sufficient to warrant such milk being not sold or even that the cow be slaughtered. At present this was not the law; this and other new enactments in the same direction were urgently required. In the second place, much could be done with the powers which local authorities possessed. By bacteriological examination, it was possible to determine with great accuracy whether tubercle bacilli were present in milk. Such an examination had also the great advantage that it could be applied to milk coming from outside the area of the local authority. It had the drawback that a delay of at least three weeks was caused before the results were obtained, while it had to be followed up by veterinary examinations to detect the peccant cow or cows. Veterinary inspection, on the other hand, offered no delay, but it was less accurate, and could not be applied (without special powers) to cows outside the area of the appointing authority, but into whose district the milk came. He believed that a combination of both methods was necessary and desirable. It was only fair that a certain measure of compensation be paid for slaughtered tuberculous animals by those who profit by such compulsory slaughter.

Dr. H. Llewellyn Heath (Ipswich) said he considered that in the second interim report three sentences summed up the important results associated with the Commission's enquiry:—" The human body can be infected by bovine tuber-

culosis." "There can be no doubt but that in a certain number of cases the tuberculosis occurring in the human subject, especially in children, is the direct result of the introduction into the human body of the bacillus of bovine tuberculosis; and there also can be no doubt that in the majority at least of these cases the bacillus is introduced through cow's milk." "A very considerable amount of disease and loss of life, especially among the young, must be attributed to the consumption of cow's milk containing tubercle bacilli." He wished to speak particularly in the interest of the child, because he felt very strongly the force of Behring's contention when he said, "It is not yet proved that healthy full-grown persons become ill with tuberculosis as a result of eating food from tuberculous cattle (milk, butter, meat), unless the epithelial covering of the intestinal mucous membrane is defective or ulcers exist after exanthemata, typhoid and dysentery." He quoted Behring also to the effect that the infant's risks of infection were greater because "the gastric mucous membrane in the infant possesses no continuous epithelial covering, and the gland tubes of the ferment producing glands are little, if at all, developed at this time." He laid stress on the fact that in older children we have to consider the individual's resistance power, and dwelt upon the importance of dealing with unhealthy conditions of the tonsils and pharynx in children, the probable point of entry of the tubercle bacillus in the majority of instances of tubercular infection of the cervical glands. In support of his views he quoted the experiments of Prof. Sidney Martin and the observations of Prof. Sims Woodhead. Referring to the conclusion of the Commissioners that their results "clearly point to the necessity of measures more stringent than those at present enforced being taken to prevent the sale or the consumption of such milk," he drew attention to the experiments of Prof. Calmette and M. Breton which suggested that the sterilizing of milk containing the tubercle bacilli did not render it safe for use. He alluded to the milk regulations enforced in Dusseldorf, particularly in regard to any milk sold as "children's milk," the consent of the municipality having to be obtained before milk offered for sale can be so designated. He said that in Ipswich the Board of Guardians, having 250 children, not including infants under two years of age, had regulations in regard to the milk supplied by the contractor. One of the requirements is that a veterinary surgeon's certificate shall be shown for every cow from which milk is taken, and certificates shall be given only for such cows as have failed to react twenty-four hours after the injection of the tuberculin. He concluded by suggesting that we should follow the lead of Norway where, for ten years, compensation has been paid by the government to all cattle owners who slaughtered their tuberculous cattle. Since 1905 the government has required that all cattle bought in for farming purposes shall be tested and if they react they are branded and isolated.

DR. G. S. ELLISTON (Ipswich) recalled a meeting ten years ago, when a crusade against tuberculosis was started at a large gathering of the town and

county. Much enthusiasm was shown at the time, but at the end of twelve months public interest waned, and the subject was gradually dropped. It was very gratifying in looking back to see what great progress had been made in the meantime. Dr. Pringle's paper that day had proved how susceptible the cow was to tuberculosis, and how important it was to attend to its health. He was of opinion that in country districts the cow was not lodged with a due regard to hygienic surroundings; the cowsheds were frequently dirty, badly ventilated, and overcrowded, and the process of milking was carried on with a disregard to cleanliness. He considered there was a wide field in some country districts for improvement in those matters, and that a great responsibility rested on the County Councils, and in a less degree on Urban and Rural District Councils, in carrying out the various orders.

Mr. Kerry Rix (Lowestoft) said he was familiar with the Dairies and Cowsheds Order, and from experience and observation was of opinion that the Order needed strengthening and modifying in various respects, for whilst the interiors of the cowsheds were as a rule kept in strict accordance with the regulations laid down in the Order, the exterior was of an entirely opposite character. In many cases the excreta was thrown into a yard through which the cows passed, and there was frequently a mass of filth up to the cows' udders through which they had to wade to pass to the milking shed. The ponds at which cows drink when out to grass should be subject to supervision.

Mr. J. A. Smith (Ipswich) said it should not be lost sight of that in the experiments of the Royal Commission a very extravagant dose of the germs of infection was given, and it was no wonder that they got such successful results. He did not think it was proved that Dr. Koch was wrong, and the case could not be put stronger than as one of strong suspicion. Even in that light he thought it fully justified every effort to stamp out bovine tuberculosis. The tuberculin test had been mentioned, but was it conclusive? He thought not. He thought that if the authorities were to insist on tuberculous animals being slaughtered they must pay compensation. The Dutch were making a tremendous effort to rid their cattle of tuberculosis, and since 1905 had fully 8,000 cattle disappropriated and slaughtered by the Government. If anything was to be done in this country it should be taken up by the Local Government Board and the Board of Agriculture acting together, and he recommended a system of compensation for a certain number of years, say five, six, seven, or eight. Then the farmers would be anxious within that time to find out which were the tuberculous animals. The contemplated legislation should be general. applying to the whole country, and not by private Bill legislation, applying only to particular towns. After suggesting a crusade against the house fly as a conveyor of infection, he referred to the effects of dust in a town, and urged all dairymen to filter their milk while it was warm through cotton wool. He alluded

to the recent International Dairy Congress at the Hague, which he had attended as a British delegate, and advocated a careful consideration of their Report. He remarked that at the Government Experimental Dairy Farm at Hoorn the cows' tails were tied upwards; this was conducive to cleanliness at the time of milking.

DR. JANE WALKER (East Anglian Sanatorium, Nayland) pointed out, with regard to the tuberculin test, that a cow that reacted under the test would not react again for six months, so that there was nothing to prevent an owner selling a cow after the first test to someone else, who, on having it tested, would find that it would not react.

MR. G. P. WATKINS (Ipswich) said there were a few points mentioned in Dr. Pringle's paper on that subject to which he thought it might be advantageous to give a little further consideration. As one interested in a small way in the breeding of cattle and production of milk (and he thought at the same time he should be expressing the opinion of all likewise interested) the prominence given lately to that matter had certainly increased their sense of responsibility, so far as it related to their business. At the same time, it was self-evident that selecting and breeding only from sound stock, and the maintenance of the health of their herds, was recognised as of the greatest importance from a business point of view, and was ever kept in mind. They had lately heard so much about the dangers of tuberculous meat and milk, that if only a part of it were true, they might still wonder how any person could be free from the disease, or alive at all. Turning to Dr. Pringle's paper, wherein he said that this disease was "the greatest curse to which humanity is heir," and further, "Tuberculosis we now know to be an entirely preventable disease. There are many eminent observers who, viewing the enormous fall (nearly 50 per cent.) in the tuberculosis death-rate during the last sixty years, prophesy the extinction of the disease within fifty years from now," and then of preventive means, almost in the same breath, he points to "the eradication of the disease from cattle" as the solution of the problem. That appeared to him like a "red herring," and must, if followed, divert attention and shift responsibility from those responsible for carrying out reforms in the conditions of living which were generally recognised as conducive to fostering that disease in human beings. No one had ever attributed the decreasing mortality to the improved health of their cattle, or the conditions of milk supply (even if that were the case, the credit was not due to legislation) but that the rapidly decreasing mortality from the white plague was due to recognising the paramount importance of carrying out the laws of hygiene in general, was obvious to all. Then again, the increasing consumption of milk might also have had some credit for lessening the mortality. Statistics revealed the fact that a much higher rate of mortality from tuberculosis occurred in towns than in the country, though for generations more milk had been consumed by dwellers in the latter. During the discussion, Dr. Elliston and others referred to improving the conditions of cow-houses and the milk supply. No doubt

there was further room for improvement in that way, and every effort, voluntary or compulsory, should be made to obtain it; but he could say, with considerable knowledge of those conditions, that he would rather live and sleep in the majority of cowsheds in this country than in the dwellings of thousands of the human family as existing in the crowded, low-lying parts of many of the towns of this and other countries. It surely could not be expected that the purest possible milk supply would further the aim in view, whilst thousands of families were reared in the courts and alleys of densely populated areas, which most readers could call to mind, though never visited from choice. There was great value in the native resisting power of the constitution at such times as the individual came into contact with contagious disease. Myriads of germs, harmful or otherwise, entered their systems every moment of their lives: and in cases of epidemics, it was a question of resisting power who succumbed or otherwise, and so it was with tubercle bacilli. It could not be expected that a maximum of resisting power could be maintained in slum conditions of life. If they reminded themselves of the methods of treating consumptive patients (plenty of pure, fresh air and the particular situations chosen for sanatoria) they plainly indicated that what would cure was also the best preventive; and consumption, not being hereditary as a disease, but as a tendency, pointed to a means of overcoming that weakness, and further reducing the death-rate, by making every effort that those so afflicted should live in open situations, whilst other conditions received due attention.

Mr. William Deacon (Ipswich) asked if the same precautions against tuberculosis were taken with imported milk, pure fresh milk, and more particularly tinned milk. He drew attention to a brand which was crossed with large red letters, "guaranteed machine skimmed," which in itself was perfectly correct, but, with the class of people using tinned milk, led them to think that the guarantee was a warranty of a pure new article, instead of being a separated article, and suggested the possibilities of preservatives being used which were barred to the English producer. He also asked if the question of infant mortality was due to the pure milk supply, or tinned milks, or cows affected with tuberculosis. The statistics did not state which class of people formed the majority; his experience was that, with the poorer classes, a gill of pure new milk was a big investment and almost a luxury.

Dr. J. E. Chapman (Clacton-on-Sea) said that Dr. Pringle, in opening the discussion, had emphasised the fact that the vast majority of cases of human tuberculosis were due to a pre-existing human source. In any public scheme, therefore, for combating the disease, provision must be made for dealing with these human foci of infection by means of homes for certain advanced cases, sanatoria for educational and curative purposes, dispensaries, etc. At present, when so many public authorities were considering the possibility of establishing

sanatoria, it was very desirable that they should have some idea as to the cost of maintenance of such an institution, since the cost of maintenance being a constantly recurring charge, was as important as the capital cost of any scheme. He had been asked to take part in the discussion so that he might bring to their notice some facts as to the cost of treatment of consumption in the sanatorium with which he was connected. Coppin's Green Sanatorium was established to provide efficient treatment for consumptive men who could afford only a small fee, at the lowest possible cost, due regard being paid to comfort. Advanced cases were of course ineligible. There was accommodation for 19 men. In the sanatorium they charged the full cost of treatment to each patient, and all work done by the patients (except bedmaking) was paid for according to its value. The following statement of account, therefore, represented the entire cost of the maintenance of the institution. The abstract presented embraced the period from the opening in February last to the beginning of October, a period of eight months:—

	£	s.	d.		£	s.	d.
Fees received	516	11	7	Food	261	13	11
				Administration	235	1	3
				Balance	19	16	5
	£516	11	7		£516	11	7

No allowance, however, had been made in the above account for salary for the medical officer. In the first place, Dr. Chapman called attention to the fact that the results had been obtained during the first eight months' working of a new sanatorium, a period during which working expenses were always heavy and the patients relatively few in number. At first they had only 6 beds available, then 12, and later still 19. The average number of patients in residence throughout the period had been only 12·8 for this reason. Yet, although the sanatorium had only two-thirds of its full complement of patients, it had been able to pay all out-of-pocket expenses, and leave a small balance on the right side. If the sanatorium averaged 17 or 18 in residence, it would be possible to pay a medical officer £150 per annum and still leave a fair balance for contingent expenses; in fact, that was about what they had been doing since the full number of beds had been available. If the statement of account was reduced to one of income and cost per patient per week, they found

Fee charged	£1	3	3	Food	£0	7	9
				Administration (including food of staff)	0	15	6

With regard to the fee charged, he stated that they had 15 beds @ 25s. per week and 4 @ 13s. 4d., the latter being for workers whose disease was more or less completely arrested, and who stayed on on the understanding that they did all the work in their own ward (for which, however, they were not paid) and work in the market garden attached to the sanatorium, for which they were paid according to the value of the work done. The cost of the dietary was

perhaps the most important item in the finance of any sanatorium. The dietary they used had been arrived at as the result of some three years experimental work at Mundesley and elsewhere, and was, from a clinical point of view, thoroughly efficient. Perhaps the best evidence of its satisfactoriness in other respects was the fact that both his staff and himself took exactly the same diet as the patients. The cost of the diet, viz., 7s. 9d., included, however, the cost of sundry invalid foods, which added very considerably to the total cost. He estimated that the diet of the convalescent patients and staff cost between 7s. and 7s. 3d. per head per week. The cost of food per head, although low, was not by any means so low as it might be, for Dr. Bardswell and himself obtained excellent clinical results some years ago with an experimental dietary costing only 5s. per week; that dietary, however, was not very palatable and lacked variety, and was therefore unsuitable for use in a sanatorium. He referred to it merely to show that other matters besides adequate nutritive value and low cost must be taken into consideration in constructing a suitable dietary. He stated that the nutritive value of their diet, as ascertained by direct weighing, averaged in round numbers: proteids 150, fat 130, carbohydrates 450, with a caloric value of 3,670. With regard to the cost of administration, perhaps the most important feature in effecting economy was the fact that patients slept in small wards; that meant a very great saving of labour in cleaning, etc. The staff consisted of a housekeeper, a trained nurse, a cook, and two maids; a certain amount of work was done by patients, who were paid for what they did. The cost of heating and lighting had been low, as the period extended over spring and summer, but that had been more than counterbalanced by the heavy initial office and dispensary expenses. Allowance had also been made for rent, rates, taxes, insurances, repairs, and interest on capital. He thought he might sum up the whole matter by stating that it was possible to treat 20 patients adequately, due regard being paid to their selection, at a cost of from 21s. to 23s. per week. Time did not allow him to refer to the clinical results obtained, nor to the market garden, where they employed such patients as were willing to work in order that they might earn something to meet the expenses of their treatment, but he was content if he had shown that consumption could be and was being treated efficiently as a cost certainly not greater than that of the treatment of any other infectious disease. He had given only a very rough outline of the finance of the sanatorium, but he would be glad to give full detailed accounts and any other information he possessed to anybody who was interested in the matter.

Mr. G. T. Moss (Ipswich) urged more combination of authorities to fight consumption, and greater strictness in the supervision of persons selling milk under doubtful conditions.

THE EVOLUTION OF OUR SANITARY INSTITUTIONS.

A PLEA FOR A MINISTER OF PUBLIC HEALTH.

By F. G. BUSHNELL, M.D.,

Pathologist, Sussex County Hospital.

I BELIEVE that my subject is one of interest to all, as well as one of practical politics, so that I do not hesitate to introduce it. I will deal with it as follows:—

1. The evolution of our organisation in State Medicine up to the present day in this country.
2. The constitution and role of the proposed Health Ministry and the co-ordination of the public medical services, whereby our system may be extended and strengthened.
3. An outline of the problems which would confront a Minister of Public Health.

I need not apologise for the dryness of the bones of sanitary history, as I hope to clothe them with vital substance. Its progress, as you are aware, has been always allied to that of the British medical profession. I should say that the classic in which one must study English sanitary history is the work of the late Sir John Simon, "English Sanitary Institutions."

From this we learn that up to the reign of William IV., 1830–1837, the Statute Book contained *no general law* of sanitary intention if one excepts a Quarantine Act and an annual vote of £2,000 to the National Vaccine Board. What national wave of feeling gave the impetus to sanitation in this land? Pure panic, which this country shared with others when *Cholera Asiatica* appeared in Europe, and still more so when it entered England in 1831. Such an unreasoning motive power is still, it is feared (at least, up to 1884, when cholera last threatened us), the most effective, if temporary, stimulus to progress. It resulted in 1831 in the formation of a Consultative Board of Health, consisting of the President and four Fellows of the College of Physicians, the Superintendent-General of

Quarantine, the Director-General of the Army Medical Department, the Medical Commissioner of the Victualling Office, two Civil Servants, and a paid Medical Secretary. This Board worked with activity and good sense.

The year 1834 was marked by the passing of the Poor Law Amendment Act, notable because it gave occasion a few years later to the beginning of a public sanitary inquiry.

Mr., afterwards Sir, Edwin Chadwick became Secretary of the new Poor Law Board, and his efforts in the cause of hygiene were monumental.

In 1837 the Act for Registering Births, Deaths, and Marriages became law, whereby the statistics of life and death became possible; the necessity of which is now recognised.

With Queen Victoria's reign began a new era. The demand for sanitary reform may be said to have begun in this country in 1838; the Poor Law Commissioners drawing attention to preventable disease as a cause of pauperism. Mr. Chadwick issued his general report on the sanitary condition of the labouring population of Great Britain in 1842, and this was supplemented by a special report on the practice of interment in towns.

This was followed by the Royal Commission of 1843–5, whose report resulted in legislation on sewerage and drainage, on removal of nuisances, and on prevention of epidemic diseases. I can only sketch to you the broad effect of the later legislation of 1848. A General Board of Health was established for control and regulation of local improvements and the prevention of disease. Health nuisances could be dealt with by local justices on complaint by a local authority. Modes of procedure were provided by which the larger powers required for purposes of local sanitary regulation were provided. In epidemic periods the Privy Council could bring into force by order certain provisions of the Nuisances Removal and Diseases Prevention Act, by which the General Board was to have certain powers of imperative direction, and the local authorities were to have special powers of local action. The General Board consisted of three persons, with a medical member for particular times, but its obvious disadvantage was that its proceedings were not controlled by a Minister responsible to Parliament.

Various voluntary associations of the period diffused and popularised the sort of knowledge which had been before Parliament. The Board, as originally constituted, terminated in 1854, but was renewed annually until 1858. It was assisted by a Medical Council. In 1858 its medical duties were assigned by the Public Health Act of 1858 to the Privy

Council, to which department the medical officer of the Board was transferred, and by the Local Act, 1858 (amending the Public Health Act 1848) the other duties were assigned to the Home Secretary.

An appointment of note was that which initiated medical officerships; the first medical officer of Liverpool was Mr. Duncan, in 1847, and of London, Sir John Simon, in 1848. The central medical officer was created in 1855, and the post was held by the late Sir John Simon for nearly twenty-one years. He was attached, from 1855 to 1858, to the General Board of Health; from 1858 to 1871, to the Lords of the Privy Council; and from 1871 to 1876, chiefly to the Local Government Board, established in 1871. Since 1876 the central medical officer has been the principal medical officer of the Local Government Board, with ill-defined duties. About 1858, the first public health lectures were given by Dr. Greenhow at St Thomas's Hospital, and to Dr. Greenhow was due the reduction of the data of deaths from the General Register Office to a standard death-rate *per 100,000 living*. The records and publications of the General Register Office had now begun to exert an important influence on sanitary progress; and improvements had already begun to be initiated in sanitary apparatus of drainage, etc.

A year of mark for sanitary progress was that of 1858, when the Medical Act of that year controlled the British medical profession, and established the medical register. The Medical Department under the Privy Council steadily developed, and its machinery was perfected. It promoted an efficient system of vaccination; valuable statistics were collected as to fatal diseases, the distribution of phthisis, and deaths of infants.

Later the great Sanitary Act of 1866 was passed, which really began a new epoch of hygiene at the instigation of the Medical Department of the Privy Council. This Act introduced the obligatory nature of certain duties of local authorities and largely increased their powers; gave power to provide water supply; regulated tenement dwellings; made enactments in relation to contagious diseases; gave power to provide hospital accommodation, mortuaries, disinfection; extended the term "nuisance," by which overcrowding of dwelling-houses, factories, and workshops was dealt with. This was a year of great cholera prevalence.

In 1868 a new vaccination law was passed, which was tested by the storm of smallpox which swept over London in 1871. The Medical Department of the Council was strengthened in 1869, and £2,000 was granted as an annual subsidy to scientific investigations in 1870. In 1871 a Secretary for Public Health was appointed, and the Royal Sanitary Commission met and made important recommendations as to consolidation

of central responsibilities and as to local medical officers. I am proud to say that it was a joint committee of the British Medical Association and the Social Science Association which memorialised the Government in May, 1868, for a Royal Commission. The recommendations of the Commission were, in brief, that administration concerning the public health and the relief of the poor should be in separate departments. It was thought that the motive power, as well as the sanctioning of sanitary progress, should lie with the Board. It was to have a legislative side to amend and promote law, and an administrative side to organise an efficient system of supervision. It was to be helpful, admonitory, and stimulant; compulsory, if needs be. As we know, this scheme was not adopted, but administration was centred in the hands of a *single secretariate.*

The new office started virtually as a continuance of the old Poor Law Office, and it was as if the old Poor Law Board, subject only to such conditions of consultation and reference as it might impose on itself, was constituted Central Sanitary Authority. To this we may ascribe the unsatisfactory areas in which many local medical officers serve, the moderate amount of central inspection existing over local sanitary districts, and the chaotic state of our organisation in general. A forward policy of legislation was not adopted, but sanitary administration relied, and still relies, for motive power practically on the educational influence of inspection and advice. Had the hint of the Sanitary Commission been followed the Secretary and Engineer Inspectors, who worked the Local Government Act of 1858 under the Secretary of State, and the Medical Department, which had worked the Public Health Act of 1858 under the Privy Council, would have formed the Health Division of the new office as formerly under the General Board of Health. The Act which constituted the Local Government Board was passed in 1871, and the staff of the Poor Law Board General Office, Local Government Act Office, and partly of the Medical Department of the Privy Council, were made part of one Board.

In 1872 the Act was passed which amended the constitution and powers of local authorities and further concentrated central responsibilities, and this Act together with an Act of 1874 introduced various minor amendments of law. At last, in 1875, was passed the great consolidating Public Health Act which it had been the object of the Commission to secure. In 1875 was passed the Sale of Food and Drugs Act; in 1876, the Pollution of Rivers Act; in 1878 the consolidating Factory and Workshops Act and the Contagious Diseases (Animals) Act; in 1879

the Public Health (Interment) Act; in 1881 the Alkali, etc., Works Regulation Act; the Dairies, Cowsheds and Milkshops Order in 1885; statutes which, with the Artizans' Dwellings Improvements Acts, 1875–1882, and the Housing of the Working Classes Act, 1885, and with the principal Act of 1875 constitute our national sanitary code of laws.

Legislation of more recent date (as that of 1890) than this is within the memory of most of us.

The Medical Act of 1886, though amending that of 1858, did not institute a one-portal system of entry into our profession, but the inspection of examinations by the Medical Council under the Privy Council.

Under the scare of Cholera, 1884, a survey was appointed with four inspectors added.

The Local Government legislation of 1888, 1889 dealt with county medical officers' reports, etc., and of district officers, but decentralisation of power to county councils was the essential feature.

In 1889 the Infectious Diseases Notification Act was passed.

The second portion of my theme is the constitution and role of the proposed Health Ministry and the co-ordination of our public medical services.

The basis of any national scheme of health organisation is to my mind a Minister who, with his department and service, would be closely associated on the one side with the medical profession and on the other with the public. I would add that an expert Minister, of Cabinet rank, would be the ideal person if such a leader could be found. In other words, his special powers and influence should be as full as possible. I attach great importance to the individual as leader. Do we not see from the Messiah and Mahomet to Lord Lister, General Booth, and Mr. J. Chamberlain the proof of what I say? What improvement in national health, happiness, and prosperity would have resulted with great leaders of health.

Then the Minister would be immensely strengthened by close association with an *Advisory Council*, representing largely the medical profession of the Empire. Such a Council would collate, record, and advise the Minister on all, *especially legislative*, matters relating to public health in the Empire.

On such a Council, in addition to the representatives of the medical profession at home and the Colonies, would be found those of all the great Departments of State, including the public health services (Civil, Naval, and Military, the last two being, of course, independent administratively),

the Education Department and medical education, the Home, Colonial, and Foreign Offices, Veterinary Medicine, and the Board of Agriculture, India and the Colonies.

The Minister would also preside over a Public Health *Committee*, which would be a department to administer the Public Medical (civil) Services. It would be based upon the Local Government Board and General Register Office, and consist of representatives of Public Health, Pathology, the General Register Office, engineering, law, poor law, finance, with perhaps a Parliamentary secretary. The extremely valuable scientific work which has emanated from the Local Government Board in the past is a good augury of what its laboratory investigations of preventive medicine problems might develop into.

The object of the Ministry would be to see that preventable disease is prevented by the application of scientific knowledge, and of its Administrative Committee to see that there was a national system of health officerships, so that local authorities should have at their service an officer of special qualifications bound to observe, inquire, and advise impartially in all matters concerning the health of his district. We know that this is not yet attained, and that faulty local sanitary arrangements are identified with too powerful private interests.

Above all, the tenure of office of the health officer must be improved, as the Society of Medical Officers of Health has affirmed.

In order to carry out the prevention of disease, adequate numbers of medical inspectors are required, who would visit systematically places where local excesses of disease exist, in order to confer with authorities and officers on their origin. Equally, also, the medical responsibility of the Poor Law, of Public Vaccination, and of Local Sanitary Officers should rest with them. Such systematic and methodical territorial inspection is known not to exist, and it would entail considerable enlargement of the staff to watch the excesses of preventable diseases presented in the local annual reports. Such an inspection department would be the eyes and ears of the Administration and responsible to the Minister, and would afford him information by actual *inquiry* of the conditions locally, and of the endeavours being made or necessary to supervise, check and watch filth, industrial and contagious diseases, and infant mortality.

Essentially the system would be one of *visitation and not of correspondence.*

Another division would consist of the *public medical services*, viz., civil medical officers of sanitation, schools, factories, poor law and pathology, bacteriology and quarantine, responsible to central as well as local

authorities, adequately organised and with such security of tenure of office as to defend them against *unjust and undue interference in the proper and conscientious performance of their duties.*

A word may be said in conclusion as to the role of the Minister and the problems confronting him. He would be free from the incubus of the control of the machinery and finance of municipal services apart from health law. At the same time he would be in close relationship with the Local Government and Education Departments; he would have the advantage of a medical training, and would be the mouthpiece of the medical profession of the Empire on the conditions and requirements of the national health.

As Dr. R. Rainy, M.P., recently said at a meeting discussing the need for a Minister of Health, the Minister would take charge of the air and would see that our air was supplied properly, also the light; and that the conditions under which food is bought and sold, and the source of supply, were satisfactory.

The medical condition of children educated by the State would be observed by him and regulated; and water supplies, drainage, and sanitary works, together with the conditions and hours of labour, would be duly supervised by him. He would educate people in what produced health and ill health. The question of vaccination and the specific treatment of disease, as well as the conduct of research, would be his.

Above all he would use his influence and machinery to prevent deaths and disability from preventable diseases, as presented by the casualty lists of the Registrar-General and of local authorities.

In the light of New Zealand's happy experience in their first Public Health Minister, Sir Joseph Ward, we may now say that it is only a question of money that weighs against an improved standard of national health and a higher level of happiness and prosperity.

Public opinion is as ripe in this country as it is in Canada, New Zealand, the United States, or the Continent for this appointment; and we should see to it, by urging the appointment of some Commission, that this living question may not be allowed to drop out of the range of practical politics.

NOTES FROM THE REPORTS OF THE MEDICAL OFFICERS OF HEALTH.

Extract from the Report of the Medical Officer of Health for the City of Liverpool, 1906,

E. W. Hope, M.D., D.Sc.

CONTROL OF MILK .SUPPLY.

Milk supplied from outside the City Boundaries.

Under the Liverpool Corporation Act, 1900, inspectors systematically visit various places supplied with milk from the country, including the railway stations and hospitals, and there take samples. These samples are then submitted to bacteriological examination. Should they be found to contain tubercle bacilli (the germs of consumption), the veterinary superintendent accompanied by the medical officer of health or his representative, and furnished with an order signed by a magistrate resident within the county from which the milk is consigned (as prescribed by the Act), visits the farm or dairy and examines the stock therein. The cowsheds from which the affected supplies have been derived are situated in the counties of Cheshire, Lancashire, Staffordshire and Shropshire, and in North Wales, the first named being the largest dairy district in the United Kingdom.

The country shippons generally are found to be much inferior (from a sanitary point of view) to those within the City of Liverpool, and although, owing to the passing of the Liverpool Act, they have been greatly improved, there are many which are in a most unsatisfactory condition. In a number of cases farmers have expressed their approval of the beneficial results of the inspections made by the Liverpool Authorities owing to the consequent improvements made in the premises by the landlords.

The cattle also are neither so good, nor are they kept in the same cleanly condition, as those of the city.

When tuberculosis of the udder is suspected the necessary proceedings are taken as prescribed by the Act. They are similar in principle to those adopted within the city. Samples of milk are also taken from suspected animals, and submitted to a further bacteriological test to verify the diagnosis of the case. In the meantime the animals are isolated, and the milk dealt with as in the city.

It is not possible in all cases to find evidence of disease of the udder in the

herd, the explanation usually being that the animals have been sold on their condition being noticed by the owner, and before the Liverpool Act was put in operation.

The Local Authorities of many surrounding districts have also become alive to the necessity of insisting upon better sanitation of farms and cowsheds, and the farmers themselves in many instances show a willingness to be advised as to the best methods to adopt to keep their cattle and shippons in the most healthy and sanitary condition.

Finally, the inclusion *mutatis mutandis* of the principle of the Liverpool Act of 1900 in a general Act which would be applicable to the whole country is absolutely necessary to safeguard the milk supply of the country.

Extract from the Report of the Medical Officer of Health for the City of Edinburgh for 1906,

A. Maxwell Williamson, M.D., B.SC.

TUBERCULOUS MILK.

It is well known that tuberculous milk is very much more dangerous than is tuberculous meat, and yet the anomaly of the situation is evident when it is considered that Local Authorities are empowered to seize and destroy tuberculous animals exposed for sale for food purposes, and are not empowered to seize tuberculous cows supplying milk for human consumption. Even if the existing Acts were carried out to their full extent, it would be possible for the owner of a tuberculous cow (say with a tuberculous udder) to remove the animal from the district of the Local Authority in which it had been detected, and to transfer it to another district, where it might legally be used for milk-giving purposes, until the condition was detected by the officers of the district to which it had been transferred. Such a possibility should not exist, and, undoubtedly, additional powers are necessary in order to prevent it occurring.

Extract from the Report of the Medical Officer of Health for the County Borough of Stockport, 1907,

Meredith Young, M.D., M.S., D.S.SC., D.P.H.

DIRTY MILK FOOD.

It is with great regret that I record here a fact which I have noticed for many years, and which appears to be becoming a greater evil as time goes on. I refer to the dirty condition of the milk which is sold, not only in this town, but in, I think, all the towns in the country. The truth of these words can be amply proved by anyone who will take a tumblerful of milk, as it is delivered to him, and allow it to stand for a few hours; then pour off carefully the top portion, and pour the last two or three teaspoonfuls on to a clean white plate;

the amount of dirt which will be found in all except the most isolated cases, is one which calls for the greatest condemnation possible. In many cases the dirt is so large in amount that even after a few minutes' subsidence quite an appreciable quantity will be found, and I have frequently, when pouring milk out from a white jug, noticed that the last two or three teaspoonfuls have been literally black with dirt. One naturally asks where does this dirt come from? I may say at once that a microscopical examination of it shows that it is largely due to contamination at the cowshed, for this dirt consists of particles of dung, cow's hair, bits of clothing from the milkers, dirt from their hands, etc. The Manchester, Salford, and surrounding townships Milk Dealers' Protection Society have issued a circular to their members which, in itself, is a distinct reproach to the milk trade, though at the same time their action in endeavouring to secure a pure and cleaner milk is worthy of the highest commendation. In a few instances, which I think have been mainly confined to London, action has been taken by the sanitary authority in respect of milk of this filthy nature. I have personally communicated with a number of milk dealers who were supplying notoriously dirty milk in the town, and have suggested to them means by which they could at any rate lessen the amount of dirt supplied in the milk, but I have not yet been able to effect any good by such peaceable measures. I, therefore, suggest that a printed circular be sent to all milk dealers supplying milk within the Borough cautioning them against the pollution of their milk in this way, and that if after a short time this does not result in any betterment legal proceedings be taken against the vendors. Milk containing filth of this description can scarcely be called of the nature, substance, and quality demanded by the purchaser. It has often been urged in reply to suggestions such as those above alluded to, that farmers cannot obtain milkers who will conform to the regulations necessary to secure this clean milk. I, therefore, append a note of a few simple measures which alone are requisite in order to secure its purity:—

1—Milkers should wash their hands before commencing to milk. Any milker found spitting on his hands, or dripping milk on to his hands, for example, should be instantly dismissed.

2—The milker should be responsible for seeing that the can which he uses is thoroughly clean.

3—The cow's flanks and udders should be sponged over, and rubbed dry with a rough cloth before milking.

4—The milker should wear a clean overall when milking.

5—Care should be taken that all milk sent for a distance should be contained in cans provided with dust-proof lids.

6—Milk kept on the counter in shops should be covered over with some such thing as fine butter-muslin.

Surely there is nothing here which would involve either much time, trouble, or expense, and yet I venture to assert that if these measures were regularly

carried out the milk supply of the town would be enormously improved in purity; and what is of far more consequence to us as a Health Department, the amount of disease propagated through milk, and particularly the amount of infantile diarrhœa, would be very materially reduced.

Extract from the Report of the Medical Officer to the County Council of Nottinghamshire, 1906,

HENRY HANDFORD, M.D., F.R.C.P., D.P.H.

SCHOOL HYGIENE.

The present unsettled state of legislation regarding elementary schools, renders it very improbable that any serious progress in school hygiene will be considered until other larger, though less important, matters have been determined. If, as has been foreshadowed, the medical inspection of school children should become general, it must carry with it an improvement in the conditions, now so common, which injure the health of school children.

It is quite utopian to expect practical benefit from the systematic teaching of hygiene, even to the elder children, unless and until teachers qualified to give practical instruction are available.

The kind of teaching quoted by the Honourable M. A. Lawrence, Chief Woman Inspector of the Board of Education, as given by a "Trained Teacher of Domestic Science" in a school in the N. and N.E. division of England in 1907, is not calculated to improve the health or the intelligence of the children. "If you have cholera or scarlet fever in the house, put some onions under the bed, and they will sweep away all diseases!"

But the best theoretical teaching is vastly inferior to the smallest amount of practical instruction; and in the daily life of the school the sanitation, ventilation, light, and warming should be frequently employed as *object lessons*.

In some of the old schools the ventilation is distinctly bad, and in some of the new ones it is not what it might be. There are still schools where opaque glass is used in the windows to the injury of the sight and health of the children. In cowhouses, bakehouses, blacksmiths' shops, and factories, the law requires the walls and ceilings to be whitewashed twice a year; but there are, or were, schools where neither painting, colourwashing, nor whitewashing had been done for four or five years. The sanitary conveniences should be a model for the neighbourhood, but too frequently they are not. The strict need of economy limits the washing and cleansing of schools to an extent that is doubtfully wise. These are the matters, and not the theoretical teaching of hygiene, which would well repay a small increase of expenditure.

The following extracts from a recent address by Sir Lauder Brunton, LL.D., F.R.S., on Physical Degeneration are well worth a little careful thought:—

"Last night I was talking to a gentleman whom you all know, a gentleman who is not only known in Manchester, but is known all over the world for his

high scientific attainments, Sir Henry Roscoe. He expressed his opinion that it ought to be compulsory to examine the purity of the air in schoolrooms, and that if more than nine parts of carbonic acid in 10,000 of air were present, it ought to be a penal offence for those who had charge of the room. He told me that experiments had been made on the capacity of children for learning in well ventilated and in close schoolrooms. It has been found that the carbonic acid is a nerve poison, which prevents the child from developing its proper ability. I quite agree with him as to the necessity of ventilation, but I do not know that I quite agree with him in regard to the examination of the air in schoolrooms; because it seems to me that the better plan is to insist upon such free ventilation that it would be impossible for the minimum of carbonic acid ever to be reached, and so there would be no chance of ever having to inflict any penalty for the accumulation of carbonic acid in the schoolroom. Two or three years ago I went to Switzerland, where they pay a great deal of attention to education. I believe that in Switzerland the national bill for military service is smaller per head than in any other country in Europe, but the national bill for education is higher than in any other country in Europe. In Switzerland, during the summer, the schools are held out of doors. In winter, when it is very cold, there is an interval between the lessons. During that interval the children are turned out of the schoolrooms into the corridors or somewhere else, to shout and play, and warm themselves by running about, and the windows are thrown open, so that the air, although very cold, is very fresh, and the children come back again warm with their play, into the well ventilated schoolroom. Ventilation, then, is of the utmost importance."

Extract from the Report of the Medical Officer of Health for the City of Nottingham, 1906,

PHILIP BOOBBYER, M.D., M.S.

THE HEALTH OF LACE-DRESSING OPERATIVES.

When I first undertook, in 1905, to prepare a report upon the health of persons engaged in the occupation of lace-dressing, I certainly did not realise the difficulties involved in the production of a satisfactory report on the subject. I was, of course, aware that a certain proportion of the operatives would be found not to be continuously engaged in the work, but I was not prepared for the discovery which I ultimately made, that the number of such persons was very considerable, and, further, that the difficulty of following up the subsequent history of those who had been engaged in lace-dressing for a time, and had then abandoned it, would prove almost insuperable.

The cubic space in almost all lace-dressing rooms is necessarily large, both actually and relatively to the number of persons employed in them. This is insured by the large dimensions of the frames and fans, and the comparatively small number of workpeople employed upon each frame. In most cases within

my knowledge the cubic space works out at from 2,000 to 6,000 cubic feet per head.

The ventilation in most instances is fairly good, as the means of heating are usually redundant, and would soon raise the temperature unduly, unless the windows were opened and kept open. Moreover, the moisture evaporated from the wetted fabric would sometimes seriously diminish the relative dryness of the air, unless facilities for diffusion were given by ventilation. The window openings which serve as outlets very commonly extend to the ceiling, and are also very generally furnished with pivot sashes horizontally swung, a form of sash which allows a maximum of opening when the casement lies in a horizontal plane.

Owing to the difficulty already referred to of following up the history of lace-dressing operatives who have ceased to work as such, I have been compelled to rely to a larger extent than I originally intended upon the testimony of employers and employees with respect to the length of time the operatives in this industry have continued at the work, and the state of their health before, during, and after this period.

There are here 27 firms, employing (nominally), altogether, 1,002 adult females (159 of whom are over 40 years), 408 young persons, and 7 children. Eleven firms employ less than 20 adult females each, five between 20 and 30 each, four between 30 and 40, three between 50 and 62, one 74, one 90, one 110, and one 117.* The men (chiefly labourers) number approximately 221.†

The employers, managers, and others were officially interviewed at the factories by myself, and by (the late) Mrs. Exton and Mr. Flint, the local workshop inspectors, and were informed of the object of our visit. The testimony of these people, as furnished in the accompanying schedule, is to the general effect, without exception, that the occupation of a working lace-dresser is a healthy and popular one. The oft-recurring statement by the employers and others that "no one has left through ill-health," may be taken as substantially correct so far as serious illness is concerned, but there can be no doubt that many people are upset at the outset by the high temperature of the lace-dressing rooms, and subsequently abandon the work altogether in consequence. The allegations, however, by employers and others that regular employees have exceptionally good health, continue long at the work, and, doing so, live to old age, and often to extreme old age, are borne out by independent testimony.

The employees were interviewed by the same three persons, alone or together, at various times, at the factories and at home, and were encouraged to speak

* The number of persons found actually at work at the time of our visits to the various lace-dressing rooms were very much less than those here given. This illustrates at once the fluctuation to which the trade is liable, and the amount of casual labour in lace dressing.

† The number of men fluctuates greatly. This total was returned by the Secretary of the Notts Lace-Dressing Association, on March 25th, 1907.

freely. All these, again, are agreed in stating that work in the lace-dressing rooms, even for many years continuously, entails no damage to health.

Turning now to more serious diseases to which lace-dressers have been thought to be liable, we certainly find no special tendency to phthisis, nor other lung disease, among the women (who alone work continuously in the dressing-room), and this is the more remarkable for the fact that the majority belong to a very poor class, and live in poor houses and neighbourhoods, and that many lead irregular and intemperate lives.

Probably the strongest argument in support of the contention that lace-dressing, as now carried on in Nottingham, is a healthy occupation, is to be found in the fact that large numbers of women have worked at it for very long terms of years continuously, have had good health while doing so, and have lived to advanced old age, either at work or in retirement.

The death-rate from phthisis among the females is very low for the class to which these women belong. It is equal on these figures to only 0·5 per 1,000 of female lace-dressers, as compared with a rate of 1·4 for the City population as a whole, and one of 0·881 for all occupied females above 15 years of age in Nottingham (see Nottingham Annual Health Report, 1905, p. 77.*)

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* The 30 deaths of female lace-dressers during the 10 years, 1897–1906 occurred at the following ages and age-periods:—One at 13 years (osteo myelitis), one at 18 (phthisis), eight between 20 and 30, two between 30 and 40, six between 40 and 50, five between 50 and 60, two between 60 and 70, one at 71, one at 72, one at 75, one at 82, and one at 83. The general death-rate works out at 3 per 1,000 per annum of living lace-dressers.

NOTES ON LEGISLATION AND LAW CASES.

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COMBINED DRAIN AND TITLE.—*Defect—Light—Guarantee—Restrictive stipulation—Drain—Sewer—Vesting in local authority—Public Health Act, 1875 (38 & 39 Vict. c. 55), ss. 4, 13, 41—Public Health Acts Amendment Act, 1890 (53 & 54 Vict. c. 59), s. 19.*

The plaintiffs by an open contract agreed to buy from the defendants two houses "subject to right of light with owner of adjoining property being guaranteed." The houses had been recently built by the vendor, and contained no ancient lights. The adjoining house had also been built by the vendor, and sold by him in 1897 to D., on which occasion he and D. mutually covenanted not to do anything to prejudice the right of light to the windows of each other's premises:—

Held, that this restrictive stipulation was a defect in the title. Under part of the premises contracted to be sold ran a drain, into which opened the drains of two adjoining houses:—

Held, that this drain was a sewer, and was vested in the local authority under s. 13 of the Public Health Act, 1875; that s. 19 of the Public Health Acts Amendment Act, 1890, did not prevent it from vesting; that the vendor was therefore unable to convey all that he had contracted to sell; and that he had not made a good title.

Pemsel and Wilson *v.* Tucker. Warrington, J. 191. 2 Ch. Aug., 1907.

LIGHT.—*Alteration of building—Ancient lights—Setting forward of wall—Alteration in height of window—New window receiving same light as old—Alterations made during period of acquisition of right—Prescription Act, 1832 (2 & 3 Will. 4, c. 71), s. 3.*

The question whether the right to the access of light to a building which has been enjoyed through one window is preserved upon an alteration of the building depends on the identity of light, not on the identity of aperture.

In cases where the light comes to any window over the roof of higher buildings, at an angle, and the building is altered by advancing the wall in which the window is, the right to access of light will be preserved if any window or aperture in the new wall intercepts and gives access to any substantial part

of the light which passed through the old window. It makes no difference that the new window or aperture is at a much higher level than the old window.

No alteration of a building, which would not involve the loss of a right to light when indefeasibly acquired, will, if made during the currency of the statutory period, prevent the acquisition of the right.

Scott v. *Pape* (1886), 31 Ch. D. 554, followed.

Colls v. *Home and Colonial Stores* (1904), A.C. 179, explained.

ANDREWS v. WAITE. Neville J. 500. 2 Ch. November, 1907.

WATER-CLOSETS.—*Local Government—Local Authority—Power to order substitution of water-closets for existing privies—Bradford Improvement Act, 1873 (36 & 37 Vict. c. clxvii.), s. 21.*

A local Act provided that the corporation of the borough might "in any case where a dwelling-house within the borough shall be without a privy, water-closet or earth-closet, or an ashpit, or without a privy, water-closet or earth-closet, or an ashpit of a construction and size approved by the corporation, require the owner of such house, by notice under the hand of the mayor or town clerk for the time being, to provide such a privy, water-closet or earth-closet, or such an ashpit, or to make such reparation or alteration of the existing privy, water-closet or earth-closet, or ashpit as in such notice shall be stated":—

Held, that under that provision the corporation were entitled to require the owner of houses, which were already provided with privies, to substitute water-closets for the privies, although the privies, as such, were of good construction and sufficient for the needs of the houses.

Held, *also*, that they were entitled to require the provision of a separate water-closet for each house.

SMITH *v.* GREENWOOD. Div. Ct. 385. 2 K.B., Aug., 1907.

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DISCUSSION ON

THE SMOKE PROBLEM IN LARGE TOWNS.

Opened by LOUIS C. PARKES, M.D., D.P.H.,

Medical Officer of Health of the Metropolitan Borough of Chelsea; Consulting Sanitary Adviser to H.M. Office of Works; Civilian Sanitary Member of the Advisory Board for Army Medical Services.

(FELLOW.)

And H. A. DES VŒUX, M.D.

(Coal Smoke Abatement Society),

At Sessional Meeting, London, November 14th, 1907.

LOUIS C. PARKES, M.D., D.P.H.

IN the metropolitan area the prevention of smoke is provided for in the Public Health (London) Act, 1891, sections 23 and 24. It is the duty of the metropolitan sanitary authorities (the city and borough councils) to enforce the provisions of those sections; and no information can be laid for the recovery of any fine under section 23 except under the direction of a sanitary authority. This does not, however, apply to sec. 24, which defines as nuisances (*a*) any furnace which does not, as far as practicable, consume the smoke arising from the combustible used therein, and which is used in any manufacturing or trade process; and (*b*) any chimney (not being the chimney of a private dwelling-house) sending forth black smoke in such quantity as to be a nuisance. These are nuisances liable to be dealt with summarily under the Act, to which the provisions of the Act relating to nuisances (sections 2 to 15) apply; and

under section 12 a private individual can complain to a justice of any such nuisance and can initiate proceedings as if he were a sanitary authority.

For practical purposes section 23 of the Act, and sub-section *a* of section 24 are dead letters in London owing to the contained provisos, which render nugatory any proceedings against the owners of furnaces which do not consume the smoke arising therefrom, if it is proved to the satisfaction of the court that such furnaces are constructed to consume *as far as possible* or *as far as practicable* all the smoke arising therefrom, and that such furnaces have been carefully attended to, and have, in fact, consumed, *as far as possible*, the smoke arising from them.

In any proceedings, then, under section 23, or under section 24 *a*, the defendant is entitled to offer evidence as to the nature and use of the furnace or furnaces complained of, and it is apparent how difficult it becomes for the complainant to offer rebutting evidence on these points which would override the evidence of the maker or user.

We may, then, concentrate our attention upon section 24, sub-sec. *b*. First, it is apparent that no action can be taken against the chimney of a private dwelling-house which sends forth black smoke in such quantity as to be a nuisance. Now, apart from the question of what constitutes a private dwelling-house, about which doubt sometimes arises, there is really no reason in law, equity, or common sense why the private individual who lives in a dwelling-house should be allowed to perpetrate that for which the trader or manufacturer is penalised. In these days, when well-designed (not to say smokeless) grates, fireplaces, and furnaces are to be obtained at no great cost, the owners or occupiers of private dwelling-houses should be held responsible for occurrences which are easily preventable with a little care and forethought. It may be said that the chimneys of private dwelling-houses, taken individually, are not the worst offenders in the matter of smoke; and this is no doubt generally correct. But there are many large houses in the West End of London where the kitchen chimney at certain hours of the day, or the furnace for the hot water and heating apparatus, with which many mansions are now fitted, sends out dense volumes of black smoke, to the annoyance of immediate neighbours and to the aggravation of the smokiness of the general atmosphere. Then there is also the case of the householder whose kitchen chimney is left unswept and neglected until it catches fire. The nuisance in the event of this happening is a very serious one to the neighbours; and the effluvia arising from the partially-consumed soot and dirt in the chimney are very nauseous and penetrating. I think I may claim, then, that in any amendment or recasting of the smoke provisions of the Act,

the chimney of the private dwelling-house should no longer be exempted from the operation of the law.

The next point is as to whether the word "black," which qualifies the nature of the smoke, ought to be retained. I can see no good reason for its retention. Yellow or brown smoke may be just as much a nuisance as black smoke. It is not a question of colour, but of volume, density, and contained carbon and hydrocarbon particles. In practice also the retention of the word "black," under modern conditions, is likely to lead to injustice. The baker, from whose single small furnace and 9-inch chimney black smoke escapes for five or ten minutes, will be liable to a fine, whilst the manufacturer with his 3-ft. chimney, or the electrical generating station with its multiple large furnaces and 10-ft. chimney will escape prosecution, because the gases and smoke escaping into the atmosphere from the latter, although enormously greater in volume than the baker's contribution, are not sufficiently concentrated at the chimney tops to have a black appearance. I have myself witnessed enormous volumes of smoke escaping from these chimneys of large diameter, but owing to the dispersion of the gases over so large an area it has been impossible to record the smoke as "black," except on occasion, the nuisance to the neighbourhood from the escape of so much coloured smoke being none the less real. Surely the proof of the smoke emission being a nuisance should be sufficient, and qualifying adjectives should not be retained which bear hardly on the small offender and allow the large offender to escape.

In a recent smoke case* in a London police court the defendants called as a witness an engineering expert who had made a special study of furnace smoke. This witness showed photographs, charts, and tinted glass plates descriptive of the various shades of smoke, from absolute black, where all light is cut off, to the lighter degrees of smoke coloration. He expressed the opinion that the word "black" could only be applied to smoke from which 90 per cent. or more of the light had been cut off. This appears to me to be a shade of smoke of such blackness as is practically never seen in London, and is probably only exceptionally to be observed in Sheffield or other manufacturing cities.

The learned magistrate did not say that he accepted the scientific witness's view; but, as one of the reasons for the dismissal of the summonses was that there was a failure to prove that the smoke was black, it is evident that in all future proceedings for smoke nuisance

* Chelsea Borough Council v. Underground Electric Railways of London Company, Ltd., at the Westminster Police Court (Nov., 1907)

under the existing law, it will be necessary to take detailed scientific observations of the smoke emitted, and to bring into court photographs, charts, and tinted glasses, which will reproduce to the magistrate the exact conditions prevailing at the times of observation. The preparation of the necessary evidence on these lines could only be safely entrusted to an expert who had made a special study of the subject, and it would be impossible to give immediate written intimations of the nuisance to the users of the furnaces as required by the Public Health (London) Act.

In legal proceedings against the ordinary offender for a smoke nuisance under section 24, sub-section *b*, if the nuisance is proved, a conviction must follow, and the defendant is not entitled to urge in excuse that his furnaces are properly constructed and used with all reasonable care and diligence. Such evidence is irrelevant, and can be excluded.

In the case, however, of a railway or other company working under statutory powers, by and with the consent of Parliament, it has been held in the Divisional Court in the case of the Hammersmith Borough Council *v.* the Central London Railway (6th June, 1901), that it was sufficient answer to a complaint, under section 24, sub-section *b*, if the company could show that it was carrying on the duties entrusted to it by Parliament in the best possible practicable manner. This decision, of course, places the onus on the complainant to prove, by rebutting evidence, that the works are not carried on in the best possible practicable manner, either by reason of imperfect original construction, defective methods of working, or the use of improper fuel. It is very doubtful, indeed, if the original construction of the furnaces can be called in question in a summons under section 24, sub-section *b*. This appears to be a matter that can only be dealt with by proceedings for an injunction in the High Court. In such cases section 24, sub-section *b* is deprived of its special virtue, and is placed on no better footing than sections 23 and 24 (sub-section *a*), which have been found to be unworkable, and have in consequence become dead letters.

It is very doubtful if Parliament contemplates, in the grant of statutory powers to companies, that such undertakings should be expressly excluded from the operation of general Acts of Parliament dealing with public health. It may be said that those who are likely to be affected by the operations of an undertaking seeking statutory powers can appear before the Parliamentary Committee which considers the Bill, after giving formal notice of opposition, and ask for the insertion of a clause in the Bill safeguarding any threatened rights or interests. But the answer to this is that even local sanitary authorities are not always sufficiently

foreseeing to divine the exact methods by which such undertakings may injuriously affect the localities over which they exercise municipal control, and it is only exceptionally that private individuals can protect themselves by such means. It would, therefore, seem to be desirable in any future amendment of the Public Health Acts that a proviso should be inserted which will make it clear that undertakings which are authorised by Parliament are not in any way excluded from the operation of the general provisions of the statute.

To sum up then: an amendment of the law is required, (1) by the abolition of the words exempting the chimneys of private dwelling-houses from the operation of the law, in order that private offenders may be dealt with on the same basis as the traders and manufacturers; (2) by the abolition of the word "black," which defines the nature of the smoke, but the use of which is uncalled for and unscientific, having regard to the modern conditions prevailing in the construction and use of furnaces for raising steam; and (3) by the abolition of the special privilege supposed to be conferred on undertakings working under statutory powers, which renders them more or less unassailable by the existing smoke provisions of the Act.

An alteration of the law on the lines above suggested would enable sanitary authorities to take steps of a wider and more general nature for the suppression of the smoke trouble than have hitherto characterised their action, and, by bringing especially before the private individual or householder the fear of the law, would tend to hasten the existing movement in favour of gas for heating and cooking, of smokeless coal (whether natural or artificial) for use in fireplaces or furnaces, and of steam, hot water, and electrical plants for the same purposes.

Notwithstanding the enormous growth of London and its suburbs during the past twenty years, it is hardly possible to assert that the metropolitan atmosphere is deteriorating from the presence of more smoke and soot in the air. On the contrary, general observation seems to show that there is some slight, if not great, improvement in these respects in recent years as compared with twenty or thirty years ago. The slow-combustion grate and the more extended use of gas for heating and cooking in private houses, the increasing use of hot-water or steam pipes and radiators for warming blocks of offices and public buildings, and the modern methods of furnace construction with mechanical stokers, and combined steam and air jets to heighten the incandescence in the combustion chambers, have all tended towards the abatement of smoke and the improved purity of the atmosphere.

What is now required is the little extra leverage and stimulus to the forward movement in the required direction that would result from the extension of responsibility for the escape of smoke from manufacturers and traders to private householders, whose individual contributions may be small, but which, taken in mass, are the crux of the problem so far as London is concerned.

H. A. DES VŒUX, M.D.

IT seems curious, and is instructive, that a public nuisance, such as that from smoke, which has existed for five hundred years, and which was recognised two hundred years ago as so serious that King William III. transferred his residence to Hampton Court on account (amongst other things) of the smoke from the many chimneys in London which mingled with the fog, should only within the last few years have excited popular interest. Many of us have read a book by the late Sir John Simon, entitled "English Sanitary Institutions." He was one of the greatest sanitarians which this country ever produced. He guided the Government and public safely through many difficulties and storms, and yet in his book, published so lately as 1890, I think, there is no word on the subject of smoke or smoke abatement. Although at least two Royal Commissions had reported (1843 and 1845) on the feasibility of diminution of smoke from factories and boilers, no practical, continuous work was done on the subject until the Coal Smoke Abatement Society came into existence in 1899.

Why was this? In these days of Socialism, the ready cure for all evils or misfortunes which are detrimental to humanity, the infallible remedy is State or municipal ownership. It is interesting to observe that water has in nearly all cases been owned by companies, as well as milk, food, gas, electric light, tramways, etc., and we are constantly told that these ought to belong to the public authority, and that if they did, dirt, disease, and poverty would be extinct. I am no politician, nor am I a political economist; but it strikes me that the air which we breathe (which affects the light that animates us) is under the trusteeship of the public authority, that it is and has been a free gift, in unlimited quantities, in absolute purity, a prime necessity of life, and yet what has municipal ownership done for it? Without let or hindrance the air has been polluted and poisoned, made difficult to breathe and detrimental to health, without one word of protest from those who are its trustees. It is an old

but fairly true statement that a human being can live three minutes without air, three days without water, and three weeks without food. This triumvirate includes the absolute necessities of life. The last two being supplied by companies, are continually watched and protected by the authorities, sold under restrictions which increase in intensity year by year, so that millions of money have to be spent annually to insure their purity; but on air, the only commodity supplied gratis, all the money spent on it, is spent in polluting it. I fear it is purely a question of pounds, shillings, and pence, and I can imagine that if the air supplied now for nothing had been farmed out by Government for an annual sum to a syndicate, to be sold to consumers in the same way that water is, similar rigid restrictions would have been applied to it, as to the price per cubic foot, and as to the amount of impurity to be allowed in it. And does anyone believe that such air as we daily breathe now could have been passed as of even fair average quality by any sanitary authority in London?

The apathy of municipal bodies is well shown in the amount of smoke emitted in London from the chimneys of electric light works owned respectively by companies and municipalities. The Coal Smoke Abatement Society has had occasion frequently to complain of the smoke from the chimneys of the works owned by the St. Pancras and Fulham Borough Councils, whereas it seldom or never has to complain of the chimneys of the Chelsea and Fulham companies.

When the Coal Smoke Abatement Society came into existence, we found practically barren soil to work upon. There was no one interested anywhere, there was next to no literature, there was no knowledge as to whether smoke could be diminished or not. We were laughed at as silly faddists, scorned and rebuffed almost everywhere, but we slowly and carefully plodded on, always groping in the dark (for we met in London), and it was some years before any interest was taken in what we were doing.

Our stated policy was:—

To aid in enforcing to the utmost the provisions contained in the Public Health Act, 1891, of the existing law dealing with smoke.

Where the present law is inefficient to bring about an amendment.

To inquire into the present causes of the smoke nuisance, and the best means of removing or lessening the same, and to promote the investigation of appliances designed with that object.

To obtain evidence of the methods of dealing with smoke at home and abroad.

To promote the knowledge of methods by which the emission of smoke may be prevented, and for that purpose to encourage the organisation of exhibitions and to stimulate invention by the offer of prizes.

And to this we have adhered. The work naturally divided itself into dealing with the law as it existed; creating a public opinion; and stimulating the use of, and consequently the demand for, smokeless appliances in private houses.

There has always been debate as to which created the most nuisance; the smoke from the factory or that from the domestic chimney. It is needless to argue the point; an enormous amount of harm is done in London from the unburnt part of the 15 millions of tons of coal, whether used in one way or the other. But fortunately for the cause, an Act of Parliament existed dealing with the former. It is a clumsily worded piece of legislation, drawn, not by a man of science, but by (what I suppose is called) a parliamentary draftsman. It consists of two sections, one of which (23) is absolutely useless, and has, I believe, never been employed, and the other (24), of which subsection 6 is the only part which is operative. Nevertheless, in spite of the difficulties, of many clever defences, and much legal splitting of hairs, this subsection has up to now served us in very good stead. The difficulty has always turned upon the construction of the word "black," and the implied meaning of the section is that no smoke is actionable and none a nuisance which is not black. But the latter contention is ridiculous, as we all are aware that no smoke-fog (or smog, as I like to call it) is black, but is yellowy-brown. Of whatever hue it may be, smoke is a nuisance, the amount of nuisance depending entirely on its quantity and quality and not in the least on its colour.

A point to which I now want to draw your attention is one of the greatest importance. Certain companies receive from Parliament statutory powers, and those of them which are electric power or light companies work under a general Act entitled the Electric Lighting (Clauses) Act, 1899. Section 81 of this Act provides, "Nothing in the special order shall exonerate the undertakers from any indictment, action, or other proceedings for nuisance being caused or permitted by them." Would you believe it that a Bill called the North Metropolitan Electric Power Supply Bill received the sanction of Parliament last year, although section 4 of the Bill enacted that the company and its works shall not be subject to this clause?

I earnestly hope that those who are on borough councils will direct the attention of their councils to this ruse, for I am informed that it is being repeated in Bills for the ensuing session of Parliament.

To turn now to the remedies for the emission of smoke from factories: as I am not an engineer it will be more profitable to refer to the report tabulated by Dr. Rideal.* This report contained the most hopeful news that we have so far received, and I think it may be taken for granted that the facts are true, for, if it were otherwise, would not the outcry against our work be loud and persistent? It would make itself heard from one end of the country to the other; it would be blazoned abroad in daily and technical journals, in Parliament, and on platforms: but who has ever heard such a thing, and I can vouch for it that the Coal Smoke Abatement Society has not received one letter of complaint on the subject. Whereas, apart from these special inquiries, we have had information from firms that they had saved, in some cases hundreds of pounds, in others thousands of pounds per annum; and only last week a friend of mine informed me that two years ago his firm installed in London electric instead of steam plant, and that the saving in the first year had been £1,500. The only people who complain about the cost are those who have not tried, who cannot be induced to try, and who hate change. But it is to be hoped that the sanitary authorities will keep up pressure on the offenders, and not be deterred by the specious excuses brought forward. Compare the action of the sanitary authorities with that of Scotland Yard when pressed by public opinion. It is barely ten years since I saw the first procession of autocars leave for Brighton, all noisy, all smoking. But, fortunately for the public, the smoke of motor cars is evil smelling, and is produced at a level which soon brings it into contact with the organ of smell. The outcry was loud and persistent, and, in spite of protests from manufacturers, the smoke nuisance from motor cars is practically gone. In the year 1906, 3,752 motor omnibuses were reported by the Commissioner of Police as unfit for public use. No feeble sympathy with the manufacturer here! No leniency towards these offenders, and if the sanitary authorities could but have the courage shown by the Commissioner of Police, the factory chimneys would cease from troubling.

Let us turn now to the other part of the problem, the smoke from private houses. The Coal Smoke Abatement Society has done a vast work in carefully studying this question, and I regret to have to report that in spite of the numerous tests carried out by the Society in conjunction with H.M. Office of Works, we have been unable to discover any grate which consumes all the smoke from a fire of bituminous coal. There is a vast

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* Report based upon Returns furnished by Manufacturers who have succeeded in securing the Abatement of Smoke in Factories. *Journ. R. San. I.*, Vol. XXVII., p. 149.

difference between a good grate and a bad grate, a difference in the amount of emission of smoke of 50 per cent. at least; and for those who will not do without a fire of bituminous coal, let there be some public authority who shall decide which grate may be used and which not. Every grate for the purpose should be tested, as every motor omnibus is now tested.

The only hope for the cities of England is a smokeless fuel, either alone or combined, with a hot water, hot air, or steam system.

It is contrary to the genius (shall I call it?) of the British to like a hot-water system throughout a house such as is used so much on the Continent and in America under the name of "chauffage centrale." The objections to it are many and striking; it gives a dry heat, a stifling feeling, and it does not ventilate a room. With a chauffage centrale there must be some system of ventilation apart from the chimney, and as practically no such system exists in England, the house where it is installed would have to be largely reconstructed. But even in houses as they are, a central system might be more often employed with advantage. A radiator in the hall and others in the passages would give a large amount of heat which would be readily diffused throughout the house, and would therefore save the lighting of nearly all fires on days which were only chilly, not cold, and some of the fires on very cold days.

But it is chiefly in the further employment of smokeless fuels that the hope of domestic improvement lies. Fortunately there are several to choose from: gas, electricity, anthracite, coalite, and copies of the latter.

The Coal Smoke Abatement Society has officially tested and reported on coalite, and I hope that ere long that report will be published. For myself I am favourably impressed with it. I burnt it last year in my own house, and this I can say: it is easily lighted, burns up rapidly and brightly, and when at its best gives a more delightful fire than the best household coal. It is very hot, and has no harmful effect on the atmosphere of the room. The great drawback to it is that, being only about half the weight of coal, bulk for bulk, a greater number of scuttles of it have to be carried to the fire, causing an extra amount of labour. If sold at or below the price of good coal, it will be cheaper to burn, as it is more efficient, and less by weight is therefore used.

I have not tried it in a kitchen range, but the reports which I have received from friends are not so favourable as might have been hoped.

Anthracite is so far useless for ordinary grates, as the difficulty in lighting it is immense; and although it has been years on the market, it has not come into favour. But in spite of that it has many points in its

favour. It is the most economical fuel existing, and if burnt in a nearly closed stove, of which there are many, mostly of foreign origin, it will heat a room splendidly; as these stoves burn continuously for months with a minimum of attention and cost, there will always be a place for them.

Gas is now by far the most commonly used of smokeless fuels. It has many and great advantages: always at hand, only a match to strike to create a fire which gives out a good heat in five minutes, no dirt and no labour; it is unquestionably an enormous advance on open coal-fire heating. It has most of the points of a good open coal-fire without its dirt and without the labour connected with it. Its reputed drawbacks are, that it is dangerous, and dries the atmosphere. Of course it is dangerous if the grate is carelessly set, so that the products of combustion can escape into the room, or if it is so made that the gas itself instead of being burnt, finds its way into the atmosphere. But these are accidents of ignorance or neglect, need not occur, and probably arose in the past because the grates were fitted by those who did not understand the simple laws of combustion, and were inspected by officials from the gas companies who were not fitted, either by education or ability, for the purpose.

In my lecture to the Smoke Abatement Conference in December, 1905,* I was able to show that there had been an increase in the ten years 1895–1904, in London and its suburbs, of 700,000 gas fires and cookers. Surely this is a sufficient commentary on the dangers of these fires. With regard to the drying of the atmosphere by gas fires, I have long been of the opinion that gas fires only dried the atmosphere comparatively and in proportion to the heat produced. This is not the occasion to go into the arguments on the point, but I can state from long practical experience that the so-called drying effect is only produced when enough fresh air is not admitted into the room; and that if such a sensation is produced, all that is necessary is to open an inch or two of window and all will be changed. Gas fires do not produce the cold draught along the floor, such as is felt with coal fires, this being due to the fact that less air passes up the chimney with a gas fire than with a coal fire, and consequently the ventilating power of a gas fire is not so good as that of a coal fire. But the ventilation of a coal fire is often so great that in cold weather windows and doors are kept tightly shut to prevent the draught; whereas in the coldest weather, with a gas fire, a little open window is both bearable and comfortable.

Finally we come to electricity, of which I personally have no ex-

* *Journ. R. San. I.*, Vol. XXVII., page 64.

perience. The electric companies say to you: "You press the button, we do the rest." It is ideal! A bright fire for as long or as short a time as you wish without trouble, dirt, and labour. But there is another side, and if the electric companies are wise they will tackle an awkward question before the public find it out. The fires have no ventilating power. They consume no air, they make no fumes, but they do not help to get rid of the products of the combustion of human bodies. The public believe that they are the last word of sanitary science, but if they are used some artificial means of ventilation must be found. Where I have seen them in use they are, as often as not, placed far from the chimney to save any heat from being lost in that way.

I have always maintained that in private houses it was the kitchen chimney which emitted the most smoke, and furthermore that this was fortunate, as there existed in the case of kitchens less opposition to the introduction of change. Gas-cooking is employed most entensively, and, as far as I can learn, cooks are now converted. The objection to gas-cooking lies not with them, but with the difficulty of supplying hot water continuously throughout the house. This can easily be overcome by a coke boiler which, at a very small cost, will give sufficient hot water, not only for baths and ordinary use, but for heating a radiator or two in the passages.

What is now required is a permanent exhibition of smoke abatement appliances, and I am in hopes that ere long such an exhibition may be in existence, where those who seek may find.

Many questions, such as the relations of smoke to true fog, have been left untouched, not from want of my interest in them.

In conclusion, the introduction of any social reform involves of necessity conflicts with individuals and classes, with private interests, pecuniary and sentimental, and we must be content to go forward slowly but bravely, holding high the banner of Light, sure in the conviction that our crusade against the forces of Darkness and Ignorance will in the not distant future be rewarded with a triumph, which will restore to dwellers in cities, a possession of inestimable value, an air clean and unpolluted.

DR. E. C. SEATON (London) said in connection with the introduction to the paper by Dr. des Vœux that Sir John Simon's book, entitled "English Sanitary Institutions," was specially written as a pendant to the two volumes of "Public Health Reports" which he (Dr. Seaton) edited for The Royal Sanitary Institute; they were published twenty years ago, shortly before the appearance of the "English Sanitary Institutions" Volume. These books must be taken in conjunction as representing the writings of a great man. At page 67 of Vol. I. would be found a very important excerpt from the City Reports of more than half a century ago, treating the subject of the discussion in a broad and philosophical spirit. He would have called the attention of Dr. des Vœux to the point before, but had had no opportunity of doing so. He thought it better to correct what might give rise to a wrong impression with regard to Sir John Simon. Dr. Seaton then proceeded to refer to Nottingham, the point he desired to emphasize being that in that town, when he first knew it (just on thirty-six years ago), its clear atmosphere, which contrasted so remarkably with that of several Lancashire and Yorkshire towns, resulted from the action of the manufacturers themselves, whose trade goods would have notably suffered by a polluted atmosphere. Ample boiler room and efficient stoking of factory furnaces under the iron rules of determined masters were the measures which prevented pollution of the air. These were virtually voluntary measures. So that though they had the law of the land on their side, and though about a year after his appointment they somewhat strengthened their legal position by introducing smoke clauses into their Omnibus Bill (the Improvement Act of 1874), they relied mainly on the intelligent self-interest of the population. He was medical officer of health for Nottingham for twelve years. They had very few prosecutions in that time and yet the atmosphere was continuously good. He could not, therefore, honestly lay claim to having materially assisted in producing a state of things which, by comparison with other manufacturing towns, was highly creditable. It was public opinion that was wanted in dealing with the question, and the illustration he gave showed what a powerful influence it could prove to be, independent of law. Such discussions as this were very helpful. He would have liked Dr. Parkes to have said a few words on the question whether he contemplated the expense of altering houses from the "coal" to the "gas fire" system falling on the occupier or owner. As medical officer of health for Surrey he had less to do with this important sanitary and economic problem now than in former years. But they were not altogether independent of the London fogs. He had a remarkable illustration of this fact when staying with his friend, the late Mr. Justice Cave, at Woodmansterne in the bad years of 1890 and 1891. From the Manor House of the village they could see the fog rolling Banstead way and spoiling the air of their beautiful Surrey Downs miles away from the metropolis.

MR. W. D. SCOTT-MONCRIEFF (Laleham) said he believed that nearly

everyone would be in general agreement with the views expressed in the two excellent papers. He thought, however, that the Smoke Abatement Society, which Sir William Richmond so well represented, would be making a mistake if they pressed too hardly on the already heavily-burdened ratepayers by any drastic interference with the open fire to which they had so long been devoted. He said nothing about manufacturers who were old offenders and might be expected to take care of themselves. The smoke nuisance should not be placed in the same position as the sewage problem, in which the law had often gone beyond the available scientific knowledge that enabled even the most law-abiding citizens to comply with it. There were statutes in force with regard to the pollution of rivers, about which the greatest patience had been exercised in order to avoid injustice on this account, and he would like to know what Dr. Parkes meant by "a little extra leverage," in his concluding paragraph, before he would agree to any drastic remedies being placed on the statute book and left to the tender mercies of the officers of a local authority to enforce. In January, 1881, he read a paper before the Society of Arts, entitled "Smokeless London," in which he maintained that if it was impossible to obtain the complete combustion of bituminous coal in a blast furnace, with an enormously high temperature and special appliances for the use of hot air, it was certainly impossible in the case of any conceivable form of domestic grate. This position seemed to be now accepted by the experts of the Smoke Abatement Society, and Dr. des Vœux said "I regret to have to report that in spite of the numerous tests carried out by the Society in conjunction with, and with the kind co-operation of, H.M. Office of Works, we have been unable to discover any grate which consumes all the smoke from a fire of bituminous coal." If they had accepted the conclusions in the paper referred to it would have saved a great amount of time, labour, and expense incurred during the last twenty-six years in attempting to achieve an impossibility. At the Conference upon Smoke Abatement, which was held under the auspices of The Royal Sanitary Institute in 1905, there was a consensus of opinion that in order to solve the smoke problem there must be some separation of the solid and volatile elements in bituminous coal before using it for domestic purposes. Hitherto the only alternatives had been either coke or gas, or the two combined, as suggested by the late Sir William Siemens; but in a paper, read in 1881, the speaker exhibited specimens of a fuel from which only a certain proportion of the volatile constituents had been extracted, and he then stated that, among other advantages, this fuel would "light easily, make a cheerful fire, and give out more heat than ordinary coal." Now, those words were almost identical with those used in the prospectus of "Coalite," a material to which Dr. des Vœux had referred. How it was that that paper escaped the notice of the "Coalite" promoters was not for the speaker to inquire. At the time referred to he considered that the gas companies, with their extensive plant and facilities for handling great quantities of coal, were the proper persons to undertake the production of this smokeless

fuel for the benefit of the community and for their own profit as well, and all that the speaker maintained about the advantages of this half coked fuel, from a money point of view, was fully confirmed by the experts who made experiments and wrote reports which appeared in the "Coalite" prospectus. If what they said was true it seemed as if the best course for the Smoke Abatement Society to adopt was to follow on the lines suggested, because a smokeless fuel that was less expensive than coal would certainly solve the problem without any undue interference with the liberties of the householder. Probably the solution of the problem would be safest in the hands of municipal corporations who had their own gas works, and who should make it their business to discover whether the statements made by the speaker in 1881, and by the experts of "Coalite," could be put into practice or not.

DR. S. RIDEAL (London) remarked that the question seemed to be whether it was possible to alter legislation on the lines of omitting the word "black." Town dwellers suffered from the blocking up of their lungs with a black pigment, when they had not been over chimney-stacks or in black smoke, but merely in the ordinary atmosphere of a town. They had not, as far as the Act would say, been in contact with black smoke, but for all that the black particles were in their lungs; and therefore it followed that these black particles could come from chimneys which presumably had not been black to the inspector who had to report these nuisances. In other words, all chimneys which gave off smoke from bituminous coal were distributing these black particles, whether one saw them or not. Wherever there was incomplete combustion of bituminous coal, these black particles were given off in immense quantities into the air, and finally found their way into people's lungs. But whether or not the word "black" was altered in the Act, it seemed to him that the invisible things in the smoke were even more injurious. The sulphur acids, which could not be seen, were after all the most harmful things both to vegetation and to health; and it had been suggested that vegetation was the best test as to whether a chimney was infringing the Act. It was most sensitive, not only to the black particles, but to the volatile oils and the sulphur acids; and there was also the sensitiveness of buildings to these acids. So that the injury to people, plants, and buildings, was not due entirely to the blackness of the smoke, but also to these invisible acids. As to the remedies, they had to realise that if injury arose from the sulphur acids (and he believed that they were the principal offenders) they were the things to be removed; and this was done by the treatment of bituminous coal in one of two ways, both of which had been referred to by Dr. des Vœux, coke and coalite on the one hand, and gaseous fuel on the other. The gas industry was a very old one, and it had been generally penalised by Act of Parliament to remove the sulphur from the gas to within about 20 grains per 100 cubic feet. Only within the last few years had many gas manufacturers secured relief from this restriction. Now, coal might contain

from 2 to 3 per cent. of sulphur, and when it was burnt in an ordinary grate, most of this went up the chimney, and was the invisible thing which caused the injury. If, however, the coal was converted into gas, there resulted about two-thirds of a ton of coke, which contained about half the sulphur, and (say) 10,000 cubic feet of gas, which contained not the remainder, for a good deal of the balance was removed in course of manufacture. The crude gas contained some 400 grains of sulphur per 100 cubic feet, and under the existing legislation, by which the gas manufacturers had not to remove the whole of the sulphur, but only the sulphuretted hydrogen, these 400 grains were reduced to (say) 40 grains. So they got 40 grains of sulphur per 100 feet of gas, which, for the 10,000 feet, gave a figure that was not very serious; 4,000 grains present in the gas from a ton of coal. Though a good many people opposed the legislation for the abolition of the sulphur clauses, he supported it, because he considered that they were a hardship upon the gas companies. They necessitated operations which caused a lot of local nuisance, and increased the cost of gas to the consumer. The companies were successful, and so had only to remove the sulphuretted hydrogen. But now in the gas from a ton of coal in London there were only 4,000 grains of sulphur, whereas if this amount of coal was burnt in an ordinary grate, 350,000 grains were given off into the air, because in the domestic grate there were no means of sulphur recovery. Therefore any increase in the use of gaseous fuel under the present *régime* was to be encouraged, because is reduced enormously the quantity of sulphur acids in the air. Coke and coalite (which were bituminous coal that had been treated before use) also contained less sulphur than coal, and therefore it was a boon to the community to use coalite and coke and gaseous fuel, which were remedies for the sulphur impurities in the atmosphere of the big towns as well as for the smoke nuisance. Their use should be encouraged before that of electricity, because some of the cases that had been referred to showed that electric installations were turning out from ordinary coal the sulphur products and black particles in just as large quantities as if the coal had been burnt in an ordinary grate. Until electricity undertakings prevented all these impurities getting into the air from their coal, the adoption of electric heating afforded no remedy for the state of things at present existing.

Mr. J. W. Lovibond (Salisbury) said that it was a public misfortune that the efforts to purify the atmosphere of large towns should be delayed for the want of a scientific definition of the term "black smoke." The term "black," when used in a popular sense, has only a qualitative meaning; its visual density varies with the proportion of accompanying white light, the angle of incidence of the impinging light, variations when associated with colour, and the idiosyncracies of the observer; this latter is the most difficult to deal with, as the mind unconsciously favours preconceived ideas. When black was used in a scientific sense, it meant that portion of white light which has been absorbed by an

intermediate body (a column of smoke, for instance), and appeared to differ from the blackness of pigment only because the sea of light in which it was seen afforded a point of comparison. The simple word "black" was therefore a term of degree which ranged from the most delicate grey to total darkness, only becoming scientific when associated with its unit value of absence of light. A column of smoke, in common with other bodies, was resolvable by absorptive analysis into three factors, light absorbed (black), colour developed, and white light reflected or transmitted, as the case might be; all these were measurable quantities, and could be stated in such terms that their combined visual sensation was recoverable at will, but in order to make a percentage statement, the unit intensity of the surrounding light must be known, as the statement would vary with every change in the light, whilst the black and the colour factors would remain constant. The measurements recorded in the table under the terms Black, Colour, and Light were those of the nine standards of the pocket observation instrument (shown on the table) made in a light of 28 units intensity; the percentage statements were therefore based on this value. The standards themselves were made up of the most neutral-tinted glass obtainable, and although the percentage of colour in Nos. 5, 8, and 9 appeared high in proportion, the transparency showed that this amount of colour was not very conspicuous in the presence of so much black. A colourless black was scarcely to be found, but was obtainable in combinations where the colour factors of the constituents were complemen-

Analysis of the Standards in the Pocket Smoke Measuring Instrument in a Light of 28 units intensity, placed in the order of value of the Black Factor.

	1	2	3	4	5
	per cent.	per cent.	per cent.	per cent.	per cent.
Black	1·25= 4·47	3·9= 13·9	6·2= 22·14	6·4= 22·86	8·6= 30·72
Colour	·45= 1·6	·7= 2·5	1·8= 6·43	1·0= 3·57	2·9= 10·36
Light	26·30= 93·93	23·4= 83·6	20·0= 71·43	20·6= 73·57	16·5= 58·92
	28·00=100·00	28 0=100·0	28·0=100·00	28·0=100·00	28·0=100·00

	6	7	8	9
	per cent.	per cent.	per cent.	per cent.
Black	8·7 = 31·07	12·5 = 44·63	15·0 = 53·58	18·0 = 64·28
Colour	1·5 = 5·36	1·0 = 3·57	2·5 = 8·92	4·0 = 14·31
Light	17·8 = 63·57	14·5 = 51·8	10·5 = 37·5	6·0 = 21·41
	28·0 = 100·00	28·0 = 100·00	28·0 = 100·00	28·0 = 100·00

tary and in colour-equivalence with each other. It should not be lost sight of that the black factor in smoke was not lessened by the addition of colour, but only altered in appearance, and if the presence of colour was held to exonerate, then the defender had only to increase the nuisance by sending more unburnt fuel up the chimney, in the various forms of hydrocarbon, chlorine, and sulphur, to escape liability.

Mr. T. G. Dee (Westminster) said that as the readers of both the papers admitted that the work in connection with the prevention of black smoke from the chimneys of factories, etc., had been carried out in such a manner that considerable improvement had been made in the past ten years, he did not think that he need say anything about that work, but he disagreed with Dr. des Vœux when he claimed that the work of smoke abatement would be better carried out by following the very active example of the police, as instanced by their action in dealing with the smoke from autocars, because the power of licensing those cars gave the police a real control in those cases which sanitary inspectors did not possess. Prior to 1891 the prevention of smoke from factory chimneys was carried out by the police in the metropolis; since then the work had been left to the sanitary inspectors of London, and had been carried out well, the only failures referred to being those occurring where the law had been proved to be weak. The Sanitary Inspectors' Association, which was formed several years before the Coal Smoke Abatement Society, determined to make themselves "masters" of this new branch which the legislature had instructed sanitary inspectors to carry out. With this object in view they in 1894, at a considerable cost, caused to be delivered in St. James's Hall, Piccadilly, a course of lectures by that well-known chemical expert, Prof. Vivian B. Lewes, on the question of "Combustion and the influence of its products on health," at which lectures the late Sir Benjamin Ward Richardson presided; thus adding the best theoretical information obtainable to their practical knowledge. If power was obtained to deal with smoke other than black or that from private dwellings, inspectors would fulfil those new duties, and this they could be assisted in if at the same time security of tenure (such as poor-law officers possessed) was given them.

Dr. J. S. Owens (London), referring to the question of smoke estimation, said that many methods had been tried to determine the actual amount of fuel which was lost in soot, as that was the really important figure which was wanted. The colour of the smoke depended upon the degree of dilution of the soot particles with flue gases and air, and was no guide as to the quantity of soot which was being emitted. Aiming then at an actual quantitative estimation of soot emitted in smoke, the following methods had been tried:—The precipitation of the soot by means of low pressure steam or a water spray, and its subsequent collection and measurement by drying and weighing. This did not give satisfactory results, although it was noted that the whole of the flue gases were dealt

with; it was also cumbrous and inapplicable as an ordinary test. The following methods dealt only with a measured fraction of the flue gases:—Passing the smoke through glass wool, cotton wool, or asbestos, and weighing before and after. Minary's process:—Passing the flue gases through an asbestos filter, burning the soot collected, and measuring the CO_2 produced. Fritzsche's method:—Passing the flue gases through a cellulose filter, which with its contained soot is then shaken up with a given amount of water and compared with a scale made by mixing 2 grams of cellulose with various weights of soot, and with the same quantity of water. All methods in which a fraction only of the flue gases are filtered must include a measurement of that fraction, and of the total quantity of flue gases. The following list of results obtained by different observers showed the position in which we stand with reference to this test:—

	Per cent. of weight of fuel burnt.
Soot recovered in a Continental lampblack factory where coal is used	3
Mr. John Graham's estimate of the carbon in black smoke (1858)	$\frac{1}{10}$ per cent. of the carbon in the fuel.
M. Scheurer-Kestner's experiments on boiler furnaces	$\frac{1}{2}$ to $\frac{3}{4}$
Prof. W. Chandler Roberts in report of Smoke Abatement Committee of 1882	$\frac{1}{20}$
Prof. J. B. Cohen, domestic fires	4·8 to 10·2
Mr. J. C. Hoadley—in black smoke when all flue gases were washed	$\frac{1}{4}$ to $\frac{1}{3}$

Prof. Roberts, after testing about 130 fires by drawing off about $\frac{1}{100,000}$ of the flue gases through an asbestos plug, came to the conclusion that such a method was unsatisfactory, and as seen above, got very varying results. He said in his report, "Future experiments with the aid of a 'trompe' that will remove large volumes of flue gases laden with soot, must determine what the true amount of carbon lost as soot really is." When only a small fraction of the flue gases is drawn through a filter there are certain fallacies which may, and probably do render the estimate untrustworthy. The velocity of the flue gases up the chimney is very much higher near the centre than near the sides, probably twice as high; now, remembering that it is this velocity which is responsible for suspending and carrying off the solid particles of soot against the influence of gravity, which is constantly pulling them downwards, it will be seen that there must be a tendency for the particles of soot to travel from the centre towards the sides of the flue, and to collect near the latter. There will then be a much larger proportion of solid matter near the sides of a chimney than near the centre, per unit volume. Here we have one fallacy, for how are we to tell from what part of the chimney to draw off a sample in order to get a representative quantity of soot. The soot particles behave differently from the gases of combustion, which tend to form a uniform mixture in the flue. It must not, therefore, be assumed that a method which was suitable for obtaining representative samples of flue gas would be equally reliable when applied to

smoke estimation. Again, when a sample was being drawn off, even if the soot particles were evenly distributed, it was very difficult, if not impossible, to be sure that the sample was a fair representative of the gases passing up the flue. Owing to soot having a higher sp. gr. than the flue gases it would always eddy in larger circles, and when the direction of the stream of gases was altered to gain admission to sampling tube, the soot particles, having a greater momentum than the gases, would tend to be flung out by centrifugal force, so disturbing the uniformity of the sample. It would seem, on the whole, that no method of estimating soot which dealt with only a small fraction of the flue gases could be satisfactory, and conversely that a true measure of the percentage of fuel lost in smoke could only be obtained when either a large fraction, or the whole volume of the smoke emitted was trapped. This can probably only be efficiently done by means of some form of centrifuge. He had carried out, on the suggestion of Dr. des Vœux, some experiments bearing on the point, and the results, although not very satisfactory as yet, might be of interest. A series of screens formed of perforated zinc and placed one above the other at intervals of about half an inch were tried. With thirteen such screens the smoke passed through them all, issuing from the top apparently unaltered. A smoke trap was also tried, formed of a large conical centrifugal chamber, into which the smoke was admitted tangentially. The exit end of the chamber was formed of a slag-wool filter of about twenty times the area of the flue. This acted well under the influence of the natural draught for a short time, but the whole surface of the slag-wool very soon became choked with soot, and then the trap ceased to act. This choking occurred in under a minute. In both these cases the intention was to deal with all the smoke formed. He was still at work on this subject with Dr. des Vœux, and hoped to obtain more satisfactory results later on. When they remembered that a factory for making lampblack, where presumably the greatest possible amount of smoke was produced, could only recover 3 per cent. of the fuel as soot, it seemed clear that the smoke emitted from ordinary fires must fall far short of this figure, and that the method at present adopted for estimating gave too high results. There was a case on record of an engineer (Mr. J. C. Hoadley) in America who passed all the flue gases from a steam boiler through a sort of scrubber, and collected, dried, and weighed the solid matter trapped. He found in that way that very black smoke contained only $\frac{1}{4}$ to $\frac{1}{3}$ per cent. of the fuel burnt as solid particles, and a large proportion of this was ash. About $6\frac{1}{2}$ tons of coal were burnt, and 42·63 lbs. was the total solids in smoke. Perhaps one of the most curious properties of carbon was its absolute opacity. An extremely small quantity, if very finely divided and distributed through the air, was sufficient to give a black appearance. The fact that smoke was produced from the volatile carbon of the fuel only, and that even bituminous coal contained only about 16 per cent. of volatile carbon, showed that there was that limit to the possible amount of smoke produced, i.e., about 16 per cent.; figures, there-

fore, much above that were clearly absurd. In conclusion, he emphasised the fact that the colour of smoke was not a safe guide as to the amount of soot emitted, and that the only figure which was of importance was the percentage of the fuel which was emitted as soot.

DR. R. DUDFIELD (Paddington) said the discussion which had taken place indicated that quality rather than quantity was the chief factor in nuisances from smoke, that was to say that, harmful as was the carbon in black smoke, the other components of smoke, such as the acids and sulphur compounds, were of more importance. It was unfortunate, therefore, that the only workable provision of the Public Health Act of the Metropolis limited the powers of the local authorities in the direction of restriction of smoke to black smoke. That being the case, some standard of tint or colour was essential to the successful use of the powers available. He was much interested in the apparatus described by Mr. Lovibond, which had not previously come to his knowledge. For some time he had been engaged in seeking a satisfactory standard for black smoke, and he was in hope of being able shortly to introduce a method whereby a scale of tints and the smoke under observation would be recorded on the same photographic plate. It was generally recognised that the emission of smoke had a close relationship to the care devoted to stoking. It was common knowledge that if the furnace door were left a little open after stoking the amount of smoke given off was greatly lessened. That practice, however, was not favourable to the rapid generation of steam. It was to the interest of all steam producers to minimise the production of smoke, as the smoke given off represented loss of heat and power. With regard to the substitution of gas for coal stoves in dwelling-houses, and especially in kitchens, a word of warning appeared to be necessary. In Paddington, where gas was largely used for cooking, nuisances from household refuse were frequent and serious. In well-regulated households, where coal ranges were used for cooking, green stuff and other putrescent refuse was burned in the range. The use of gas left no alternative but to throw the refuse into the dustbin. The nuisance which thus arose had a still more serious aspect. The putrefying refuse was a favourable nidus for the breeding of flies, which latter, on gaining access to the houses, gave rise to contamination of food, and specially of milk. In this way the use of gas fires became a factor in the production of infant mortality, the connection between the latter and the overbreeding of flies being generally recognised. He doubted whether the danger here indicated might not be too high a price to pay for the benefits which would accrue from the substitution of gas for coal fires in households.

MR. F. W. GOODENOUGH (Chief Inspector of the Gas Light & Coke Company) said he had been asked to give the meeting a few figures, as representing, he supposed, the largest producers of smokeless fuel (in the form of gas, coke, and "carbo") in the world. As to the previous speaker's remarks, the destruction

of refuse could be best dealt with by the use of the coke-boilers to which Dr. des Vœux had referred for providing a hot-water supply. These would form a cremator for the refuse as well as a heater for the kitchen in the winter, and a provider of hot water all the year round. The number of gas-cooking stoves in use in his Company's district had in the last three years grown from 233,000 to 314,000, which was an increase of 81,000, or roughly speaking 35 per cent. Of these, 200,000 were in the homes of the working classes in combination with slot-meters; and undoubtedly the enormous increase in the use of gas-cookers had had great influence on the atmosphere of London. Especially in the summer months, it was a matter of common observation that it was possible to walk down the whole length of a road in a suburban district at the time breakfast was being cooked, and not see smoke issuing from a single chimney. This showed the almost universal use of gas for cooking; and if only the public would adopt Dr. des Vœux's solution of the coke-boiler in conjunction with the gas-cooker, there would be no need to burn coal at any time of the year. His Company was not a philanthropic institution. What they were doing for smoke abatement was from a business point of view; but it was the fact that they were doing much for smoke abatement in using every endeavour to push the use of gas for cooking and heating. A large staff of women demonstrators was employed in connection with this branch of work to go round and give instruction to the cooks, or where desired to the mistresses, as to the economical use of gas for cooking. In regard to gas-fires, the number had grown in three years from 90,000 to 117,000; he referred to those supplied by the Company, and not to many others purchased elsewhere by the public. This was an increase of 30 per cent. in three years. The Royal Sanitary Institute and the Coal Smoke Abatement Society would do very good work if they could induce architects to realise that there was such a thing as gaseous fuel. As far as he had been able to find out, no architect, or practically none, ever bore this in mind when designing a building: the old coal-range was put into the kitchen as a matter of course. In America, a gas-cooking range was supplied in every flat by the landlord, and included in the rent. If only architects would wake up to the fact that their beautiful buildings would be much less damaged if there was no coal burned in open grates and in kitchen ranges, and that gas-cooking and heating had come to stay, it would be a distinct advantage from the smoke abatement point of view. Gas used with a blast was also displacing coal for industrial purposes. All the big newspapers practically were adopting gas instead of coal for the melting of their type; and in several instances this course had been adopted owing to the threat of prosecution for smoke nuisance. Gas was being very largely used as fuel at Woolwich Arsenal; and this would probably be encouraging to the Society, as being direct support from the highest authority. It had been found that the work could be done much more rapidly and certainly by this means. The same thing was also to be seen in Birmingham.

QUALIFYING EXAMINATION FOR MEMBERSHIP

In the advanced knowledge of the carrying out of an Inspector's duties.

IT has been urged upon the Council of The Royal Sanitary Institute that there is a need for some higher grade certificate for Inspectors of Nuisances who have served a term of office and proved themselves efficient and capable in carrying out their duties, and who would like to become Members of The Royal Sanitary Institute.

In order to meet this demand, and to afford an opportunity to Inspectors in office of obtaining an evidence of qualification in the practical and administrative duties of their position, the Council have decided to institute a special examination and to award certificates for this purpose.

Only Associates of the Institute who already hold certificates of qualification as Sanitary Inspectors or Inspectors of Nuisances, and who have held appointments as Inspectors or Assistant Inspectors for at least three years, will be eligible to enter for the examination.

The guiding principle of the examination, which will be *vivâ voce*, will be to ascertain that the candidates have a thorough practical knowledge of the execution of the duties attaching to the position of Inspectors of Nuisances, and are fit persons to become Members of The Royal Sanitary Institute.

In order to make the new certificate distinct from the present certificate for Inspectors of Nuisances, it will be worded as a qualification for Membership.

REGULATIONS.

The following are the conditions and regulations relating to the Examination:—

The Candidate must hold a certificate of competency as a Sanitary Inspector or Inspector of Nuisances from one of the following bodies:—

The Royal Sanitary Institute;

The Sanitary Inspectors Examination Board (formed by The Sanitary Institute and other bodies);

The Sanitary Association of Scotland.

The Candidate must be an Associate of The Royal Sanitary Institute, and must have held an appointment under a Sanitary Authority as an Inspector or Assistant Inspector for at least three years.

Application for Examination must be made on the proper form, and must be sent to the office of the Institute fourteen days before the date of the Examination at which the Candidate wishes to present himself.

The Fee for the Examination is £2 2*s.* 0*d.* It must be paid to the Secretary: 10*s.* 6*d.* on making application, and the remainder at least one week before the day of Examination.

The Candidate must produce satisfactory testimonials, from the authorities by whom he has been employed, that he has attended diligently to his duties and has proved himself capable in performing the work of an Inspector, and he must also submit a copy of any Report that he has personally prepared in the ordinary routine of his work.

The Candidate must pass a *vivâ voce* examination before the Board of Examiners of The Royal Sanitary Institute, the examination being directed to ascertain that he has practical knowledge of the carrying out of an Inspector's duties and is a fit person for Membership of the Institute.

A Certificate, bearing the Seal of the Institute, is granted to each successful Candidate.

A Certificate will not be granted to any candidate who appears to the Examiners to have any physical disability that would interfere with the discharge of his duties.

Any person having passed the Examination, is qualified for nomination for Membership of the Institute, and upon signing the prescribed form and being elected, will be called upon to pay only the reduced subscription of £1 1*s.* annually.

The Certificate will be worded as follows:—

THE ROYAL SANITARY INSTITUTE.

Certificate qualifying for Membership (after Examination).

This is to certify that ...., who has passed an Examination and obtained a certificate of competency as a Sanitary Inspector or an Inspector of Nuisances, has been further examined in the practical and administrative duties of that office, and having satisfied the Examiners of his efficiency therein, is qualified to become a Member of The Royal Sanitary Institute.

In testimony whereof this certificate has been awarded, and is signed and sealed by order of the Council.

GENERAL INDEX TO VOL. XXVIII.

INDEX TO NOTES ON LAW CASES, 1894—1907.

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JOURNAL SUPPLEMENT

OF

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1907.

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OFFICES OF THE INSTITUTE, MARGARET STREET, W.
EDWARD STANFORD, LONG ACRE, W.C.

1908.

ABSTRACTORS OF TITLES OF ARTICLES RELATING TO PUBLIC HEALTH.

H. Adams, M.INST.C.E.

H. E. Armstrong, D.HYG.

Prof. H. R. Kenwood, M.A., D.P.H.

C. Mason, ASSOC.M.INST.C.E.

G. Reid, M.D., D.P.H.

S. Rideal, D.SC., F.I.C., F.C.S.

H. A. Roechling, M.INST.C.E.

J. Osborne Smith, F.R.I.B.A.

The Institute is not responsible for the facts and opinions advanced in the Addresses, Papers, and Articles published in the Journal.

SUPPLEMENT.

TABLE OF CONTENTS.

Table of Contents (Supplement).

Reviews of Books.

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

THE BRITISH JOURNAL OF TUBERCULOSIS.*

This Journal, edited by Dr. T. N. Kelynack, begins its career (January, 1907) with a number of remarkable excellence.

The editorial gives a brief but clear account of the tuberculosis problem as it presents itself in civilised communities at the present day. The pathology of tuberculosis is touched upon, then the medico-sociological considerations involved in every movement for its prevention and cure, and finally the treatment of cases in sanatoria.

Dr. Clifford Allbutt contributes a highly interesting retrospect of lay and professional views and practices, with regard, respectively, to the pathology and treatment of phthisis in his own lifetime, ranging from the classification of all phthisis as incurable and the hot, close air and respirator treatment of his early years, to the optimistic generalizations associated with open-air treatment and high feeding in more recent times. One sentence of Dr. Allbutt's might well be inscribed as a text on the walls of many of our modern sanatoria. It is this:—

> "Let the physician tell the patient frankly that he is fortunate in himself and in his circumstances if, having reached the stage of physical signs, he is healed in less than 2½ or 3 years from the time of their first manifestation."

Dr. R. W. Philip is optimistic alike as to the future utility of Koch's tuberculin skilfully utilized, as to the success of open-air treatment properly applied, and as to the ultimate triumph of preventive measures in effecting "the final extermination of tuberculosis."

Sir Douglas Powell strikes the keynote of the great problem of prevention by asking how we can best care for the consumptive poor, and concludes a thoughtful and judicial discourse upon this text by stating that "cardinal economic laws and the traditions of a free people cannot wisely be strained in the impatient and futile endeavour to extirpate consumption entirely in a few years."

Dr. Byrom Bramwell deals with tuberculosis in Scotland, and ascribes the greatly diminished prevalence and fatality of phthisis and other tuberculous affections, which have been so notable in recent years, to improved sanitation, in its widest sense, and improved conditions of life, rather than to any measures specially directed against phthisis. He strongly supports the compulsory notification of phthisis, and emphasizes the fact that hitherto the attention of sanitary authorities has been chiefly directed to general sanitary measures, whereas what is now required is a systematic and concentrated effort throughout the country to deal with individual cases and patients, in such wise that every

* The British Journal of Tuberculosis. Edited by T. N. Kelynack, M.D. Baillière, Tindall, and Cox, London.

phthisical patient does carry out the necessary measures for making his particular case non-infectious.

Sir John Moore contributes an article on tuberculosis in Ireland, and deplores the fact that "notwithstanding the advance of preventive medicine in recent years, the plague spot in that country grows rather than shrinks." He shows, however, that public opinion in the distressful island is slowly awakening to the necessity of falling into line with the policy and practice of the rest of the United Kingdom, and other up-to-date countries, as regards the prevention and cure of tuberculosis. As Sir John Moore truly says, when tuberculosis shall have been controlled, preventive medicine will have fought its most decisive battle and won its crowning victory.

Sir Lauder Brunton writes a paper on Tuberculosis and National Efficiency, and in it arrives at the conclusion that "our hopes for the extinction of phthisis must be based upon the training of the rising generation in a knowledge of how to prevent it, rather than on any influence we can bring to bear on men and women now, though this (of course) ought not to be neglected."

Sir Hermann Weber discourses on Climate as a Factor in the Treatment of Tuberculosis, and we reproduce his practical applications, which are as follows:—

> (1) "It is of paramount importance always to ascertain the constitution of the patient, whether strong or feeble; this is even more important than the extent of the disease. Strong constitutions as a rule bear mountain climates with vicissitudes of temperature, and occasionally sea voyages: feeble constitutions require warm climates, with shelter from wind. This ought always to be kept in mind, whether the disease is quite recent and of limited extent, quiescent, or otherwise. (2) Cases with much pyrexia, even if the local affection is but slight, ought first to be treated near home, with avoidance of fatiguing journeys. (3) Cases of rather weak constitution, with chronic progressive disease and pronounced tendency to pyrexia, do, as a rule, best at warm dry places, with limited exercise. (4) Similar cases of strong constitutions, without great tendency to pyrexia, derive mostly more benefit from mountain climates, especially when the patients are young or in the prime of life. (5) Arrested cases with extensive affection feel best at warm seaside places, like the Western Riviera, but can also be treated with advantage at Bournemouth, the Isle of Wight, and the south-west of England, and at sheltered inland localities, like Pau, Archachon, Gardone Riviera, Arco, and Meran. (6) Cases of tuberculosis with albuminaria ought to avoid high elevations and seek warm and dry climates, like Egypt and the Western Riviera. (7) Chronic cases with irritable mucous membranes and tendency to bronchitis require fairly warm places of medium humidity of air, like the Canaries, Madeira, and Algiers, but can also be benefited by windless inland localities, like Pau, Archachon, Gardone Riviera, the south and south-west coasts of England. (8) For chronic cases with much emphysema high places are not suitable; they require warm places similar to those mentioned under (7). (9) Tuberculosis can often be cured in all climates, though certain climates possess advantages according to constitution and individual complications. (10) The blind confidence in climate alone without judicious management is dangerous. (11) Careful treatment in sanatoria is necessary to the majority of tuberculous patients, and is most promising in the beginning of the disease. When an intelligent patient has, by residence in a sanatorium, learnt how to manage himself, he

may continue the treatment out of sanatoria, and then the choice of climate ought to be well considered. (12) Whenever it is possible to cure a case near home, this is preferable to treatment abroad in a different climate, since it is often more or less difficult for persons located in foreign climates to retain their health or return to the home climate."

Sir Samuel Wilks contributes a note on the contrast between past and present, as regards the attitude of the medical profession in general in the matter of the treatment of phthisis. He reminds us, however, that from the times of Hippocrates and Celsus onwards there have not been wanting in any age physicians of sufficient enlightenment to appreciate the therapeutic value of fresh air and sunlight.

Dr. Francis Hare writes on the treatment of hæmoptysis by nitrate of amyl. He points out that it checks the influx of blood to the ulcerated lung tissue, but not the efflux of blood and other matters from the air passages, and consequently that its use minimises the liability to septic sequelæ resulting from the decomposition of the effused blood. On the authority of Soulier, Pic, and Petitjean, he claims for it a specific capacity for diminishing the amount of blood circulating in the lungs.

After the original articles above noticed the Journal contains, in separate sections, (*a*) accounts of certain institutions and stations for tuberculous patients, (*b*) reviews and notices of books, and (*c*) description of preparations and appliances used in, or ancillary to, the treatment of phthisis.

The information contained in this number of the "British Journal of Tuberculosis" is so extensive, so varied and so important, and the authorship of the contributions so representative and distinguished, that one cannot but realise that the future editorial task is no light one, to see that subsequent issues are worthy to follow in the wake of this first number.

P. B.

WATER SUPPLY AND SEWAGE DISPOSAL.*

The first part of this book deals with water supply and the theoretical as well as practical matters that have to be taken into consideration by those advising about such works. The various sources from which the author has obtained his information are acknowledged, and the numerous illustrations enable the reader to appreciate the description of the works he refers to.

The second part of the book is devoted to the sewage question. Commencing with the removal of house refuse both by the conservancy and the water-carriage systems, the author refers to the sewerage of towns, and the conditions which govern the efficient design and execution of such works. He then describes the various methods that have been, or are being, employed for the disposal of sewage at outfalls, and this part of the book is also well illustrated. The bacterial treatment of sewage has been so much the subject of controversy that it behoves the reader to remember that a system which is applicable to one outfall may be unsuitable at another. This has often been disregarded and much public money thereby wasted. This book will be a useful addition to the existing mass of works on the subjects of water supply and sewage disposal. H. R.

*** Water Supply and Sewage Disposal, by L. F. Vernon-Harcourt, M.A., M.Inst.C.E. 419 pp., 8vo. Longmans, Green, and Co., London. Price 14s.**

SCHOOL HYGIENE AND THE LAWS OF HEALTH.*

The Education Committee of Sheffield called upon the author of this Text-book to deliver a Course of Lectures which would assist the teacher in protecting the health of school children, and which would at the same time afford teachers an object-lesson of how the Laws of Health could be most effectually presented by them to the scholars. Dr. Porter has embodied these lectures, with some amplifications, in the present volume, with a result which calls for nothing but congratulation. Part 1. deals with the school child; and in this part chapters are devoted to the different systems in the body, the special senses, and infectious diseases. The plan of arrangement of the subject-matter of each chapter is very well conceived. If one takes the circulatory system as an example: first, the anatomical and physiological facts of importance to the comprehension of the system and its functions are described; the circulation of the blood through the different parts of the body is next dealt with; and then the more common affections of the circulatory system which affect those of school ages are described, and useful suggestions given for such assistance and treatment which the school teacher can offer. Good discretion is exercised as to the amount of anatomical and physiological information given, and it is only here and there that one reads a statement which might perhaps be omitted in a future edition, on the score that the information is not essential and has no bearing upon any possible practical application; as, for instance, the centres of ossification of cranial bones, as briefly indicated on pp. 20, 21, and 22.

The second part of the book deals with the school building, and mainly consists of the Regulations of the Board of Education, 1905, in connection with school construction, with amendments and illustrations.

The book deserves a wide circulation, and it may be confidently recommended as suitable in every respect to the class of readers for whom it has been written.

H. R. K.

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* School Hygiene and the Laws of Health: A text-book for teachers and students in training, by Charles Porter, M.D., Edinburgh, Barrister-at-law, Middle Temple. With 119 illustrations. London, New York, and Bombay: Longmans, Green, & Co. 1906. 313 pp. Price 3s. 6d.

MEETINGS HELD.

EXAMINATIONS.

The following Examinations have been held :—

Sanitary Science as applied to Buildings and Public Works.

January 25th & 26th, Plymouth. 1 Candidate; no Certificate granted.

Hygiene in its bearing on School Life.

January 25th & 26th, Plymouth. 1 Candidate; no Certificate granted, but the candidate passed Part II. of the Examination.

Inspectors of Nuisances.

January 25th & 26th, Plymouth. 33 Candidates; 15 Certificates granted.

CANDIDATES WHO HAVE RECEIVED CERTIFICATES.

Inspectors of Nuisances.

ANDREWS, GEORGE ALBERT.
BENNETT, FREDERICK GUY.
DAVISON, JAMES HENRY.
DOE, GERTRUDE ELIZABETH.
MORGAN, WILLIAM THOMAS.
NICHOLLS, ELIZABETH.
PIPER, HAROLD.
ROWDON, RICHARD JAMES.
SHORLAND, CECIL HENRY GEORGE.
THOMAS, JOHN HENRY.
TRESIDDER, MARSHALL GEORGE HAMILTON.
WATTS, GEORGE.
WILLIAMS, ERNEST.
WILLIAMS, LIONEL MANN.
WINSOR, FRANK ARTHUR.

FORTHCOMING MEETINGS.

LECTURE TO THE INSTITUTE.

London, Friday, March 1st, at 5.30 p.m., by Professor Ronald Ross, C.B., D.Sc., F.R.C.S., F.R.S., on "Points of Interest connected with Tropical Sanitation," illustrated by Lantern Slides.

ANNUAL MEETING OF ASSOCIATES.

London, Tuesday, March 19th, in the Parkes Museum, at 8 p.m. Address by Louis C. Parkes, M.D., D.P.H., on "The Training of Inspectors before taking Office."

Sessional Meetings.

Stafford, Saturday, February 16th. At 3 p.m., Discussion on "To what extent must Authorities Purify Sewage?" to be opened by George Reid, M.D., D.P.H., County Medical Officer of Health, Staffordshire. At 11 a.m., Visit to Hanley Sewage Disposal Works.

London, Saturday, March 2nd. At 11 a.m., Discussion on "The Bacterial Treatment of Sewage, with special reference to Biolysis of Organic Nitrogen," to be opened by W. D. Scott-Moncrieff. At 3 p.m., Visit to Staines Sewerage Works at Ashford.

Newcastle, Friday, March 15th. At 7 p.m., "A Sketch of the Sanitary History of Newcastle-upon-Tyne, being a continuation of a paper read by Dr. H. E. Armstrong at the Congress of the Institute in Newcastle in 1882," by J. Coote Hibbert, M.D., D.P.H., and W. H. Wells.

Saturday, March 16th.—Visits to City Hospital, Rowton House, etc.

Conference at Dublin, 1907.

A Conference for the discussion of Sanitary and Public Health Questions has been arranged to be held in Dublin from June 25th to 29th, 1907.

Facilities will also be given to Delegates and Members to attend the Irish International Exhibition in Dublin, which will be in progress during the Conference.

Patron: His Excellency the Rt. Hon. the Earl of Aberdeen, Lord Lieutenant of Ireland.

President: The Right. Hon. the Earl of Rosse, K.P., J.P., D.C.L., F.R.S., Chancellor of the University of Dublin.

Section I.—Sanitary Science and Preventive Medicine—
President: Sir Charles Cameron, C.B., M.D., D.P.H.

Section II.—Engineering and Architecture—
President: P. C. Cowan, B.Sc., M.Inst.C.E.

Section III.—Physics, Chemistry, Biology, and Meteorology—
President: Sir John W. Moore, M.D., D.Sc., F.R.C.P.I.

Hon. Secretaries: W. Kaye-Parry, M.Inst.C.E., F.R.I.B.A., M.A.
Surg.-Col. D. Edgar Flinn, D.P.H., F.R.C.S.I.

Examinations.

In Sanitary Science as applied to Buildings and Public Works,
Inspectors of Nuisances, and
In Hygiene in its Bearing on School Life—

Glasgow, Feb. 8 and 9; *Hull*, Feb 22 and 23; *Blackburn*, Mar. 8 and 9.

For Inspectors of Meat and Other Foods—
Manchester, March 22nd and 23rd.

Students' Lectures.

Sanitary Officers.

The Forty-third Course of Lectures and Demonstrations to Sanitary Officers will commence on Monday, February 11th. The Lectures are arranged to include the subjects scheduled for the Examination for Inspector of Nuisances held by The Royal Sanitary Institute and the Sanitary Inspectors' Examination Board (formed by The Sanitary Institute and other bodies).

Sanitary Science as Applied to Buildings and Public Works.

A Course of Lectures and Practical Demonstrations has been arranged to assist those desiring instruction in Sanitary Science as applied to Buildings and Public Works, suitable to Foremen of Works, Builders, and those engaged in Allied Trades, Managers of Property, Teachers and Lecturers, and others who are desirous of obtaining the Certificate of the Institute in Sanitary Science as applied to Buildings and Public Works.

The Course will commence on February 18th.

Hygiene in its bearing on School Life.

This Course of Lectures has been arranged to assist Teachers and others interested in the training of children and the structural conditions of the School, who purpose entering for the Examination of the Institute in Hygiene in its bearing on School Life.

The Course will commence on February 18th.

Practical Training for Meat Inspectors

for candidates preparing for the Examination for Inspectors of Meat and Other Foods, conducted by The Royal Sanitary Institute.

The Eleventh Course will commence on March 1st, and will consist of systematic Practical Training in the Inspection of Meat at a Cattle Market, including Demonstration on live cattle and sheep, slaughtering and dressing of animals, names and situations of the organs, diseases of animals, methods of stalling, arrangements of markets and byres, etc., and will include the Lectures on Meat and Food Inspection given in the Parkes Museum.

Special Course on Food and Meat Inspection.

Fifth Special Course of Practical Training in Food and Meat Inspection for Commissioned Officers and Professional Students preparing for the Examination for Inspection of Meat and other Foods, conducted by The Royal Sanitary Institute, will commence on April 26th.

The dates and subjects of the Lectures and Demonstrations in each Course are given month by month in the Calendar.

CALENDAR, FEBRUARY AND MARCH, 1907.

As far as at present arranged.

Council Meetings are held Monthly on the Second Wednesday in each Month at 5 p.m.

Exhibition Committee . . Congress and Editing Committee	Monday in the week preceding the Council, at 4.30 p.m. & 5.30 p.m.
Examination Committee . . Museum and Library Committee	Tuesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Special Purposes Committee . Finance Committee . . .	Wednesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Parliamentary Committee . . New Premises Committee . . Disinfectant Standardisation Committee	As occasion requires.

The Parkes Museum is open free, on Mondays 9.30 a.m. to 8 p.m., other days 9.30 a.m. to 5.30 p.m. The Library and Office are closed at 1 p.m. on Saturdays.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

FEBRUARY.

8 F. } 9 S. } Examination in Sanitary Science as applied to Building and Public Works, for Inspectors of Nuisances, and in Hygiene in its Bearing on School Life, Glasgow.

11 M. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, A: Introductory Remarks, Public Health Acts—English, Scotch, Irish; other Statutes relating to Public Health; By-laws (Model, etc.), Regulations, Orders, Memoranda, etc., by J. Priestley, B.A., M.D., M.R.C.S., D.P.H., M.O.H. Lambeth.

13 W. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, B: Public Health (London) Act; Metropolis Local Management Acts; By-laws and Regulations in force in the Administrative County of London, by J. Priestley, B.A., M.D., M.R.C.S., D.P.H.

15 F. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, C: Factory and Workshop Acts (including Bakehouse Legislation, 1878–95) as they affect the Sanitary Inspector; Smoke Legislation; Food and Drugs Acts, 1899, by J. Priestley, B.A., M.D., M.R.C.S., D.P.H.

16 S. **Sessional Meeting,** STAFFORD. 3 p.m., Discussion on "To what extent must Authorities purify Sewage?" to be opened by George Reid, M.D., D.P.H., County Medical Officer of Health, Staffordshire. 11 a.m., Visit to Hanley Sewage Disposal Works.

18 M. Demonstration in the Parkes Museum, at 6 p.m. Building Materials and Construction, by the Director, E. White Wallis, F.S.S.

18 M. Lecture to School Teachers, at 7 p.m. "Physiology," by Prof. H. R. Kenwood, M.B., D.P.H., M.O.H., Stoke Newington.

18 M. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General, A: Outdoor, by G. Newman, M.D., D.P.H., F.R.S.E., M.O.H., Finsbury.

20 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt., Public Health Dept., Borough of Islington.

20 W. Demonstration in the Parkes Museum, at 6 p.m. Baths and Lavatories, by the Director, E. White Wallis, F.S.S.

20 W. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General B: Indoor, by G. Newman, M.D., D.P.H., F.R.S.E.

20 W. Lecture to School Teachers, at 7 p.m. "Physiology," by Prof. H. R. Kenwood.

22 F. Lecture to School Teachers, at 7 p.m. "Physiology," by Prof. H. R. Kenwood.

22 F. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—C: Offensive Trades and Trade Nuisances, etc., by G. Newman, M.D., D.P.H.

22 F. } 23 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Hull.

23 S. Inspection and Demonstration in the district of Tottenham at 2.30 p.m. Conducted by J. F. Butler-Hogan, M.D., M.O.H.

25 M. Lecture to Sanitary Officers at 7 p.m. Infectious Diseases, by Prof. A. Bostock Hill, M.D., M.SC., M.O.H., Warwickshire County Council.

26 T. Lecture to Sanitary Officers at 7 p.m. Methods of Disinfection, by Prof. A. Bostock Hill, M.D., M.SC.

27 W. Inspection and Visit to Common Lodging House, Kemble Street, Drury Lane, W.C., at 2.30 p.m.; and at 4 p.m. Inspection of Messrs. Callard, Stewart, and Watt's Bakery, Little Dean Street, Soho, W.

27 W. Demonstration in the Parkes Museum at 6 p.m. Waste Preventers and Water Closets, by the Director, E. White Wallis, F.S.S.

27 W. Lecture to School Teachers at 7 p.m. "Food and Clothing," by Col. J. Lane Notter, M.A., M.D., R.A.M.C.

27 W. Lecture to Sanitary Officers at 7 p.m. "Elementary Statistics," by Prof. A. Bostock Hill, M.D., M.SC.

MARCH.

1 F. **Lecture to the Institute,** at 5.30 p.m., by Professor Ronald Ross, C.B., D.SC., F.R.C.S., F.R.S., on "Points of Interest connected with Tropical Sanitation," illustrated by Lantern Slides.

1 F. Lecture—Meat Inspectors' Course at 6.30 p.m.

1 F. Lecture to Sanitary Officers at 7 p.m. "Elementary Physics," by E. J. Steegmann, M.B., M.R.C.S., D.P.H., M.O.H., Heston and Isleworth.

2 S. **Sessional Meeting,** LONDON, at 11 a.m. Discussion on "The Bacterial Treatment of Sewage, with special reference to the Biolysis of Organic Nitrogen," to be opened by W. D. Scott-Moncrieff. At 3 p.m., Visit to the Staines Sewage Works at Ashford.

2 S. Inspection and Demonstration at the Battersea Disinfecting Station, Mortuary, and Shelter, at 2.15 p.m. Conducted by G. Quin. Lennane, F.R.C.S., L.R.C.P., D.P.H., M.O.H., Battersea.

5 T. Demonstration of Book-keeping as carried out in a Sanitary Inspector's Office, at the Public Health Office, Town Hall, Upper St., Islington, N., at 7 p.m., by James R. Leggatt, Supt. Public Health Dept., Borough of Islington.

6 W. Lecture to Sanitary Officers at 7 p.m. "Elementary Physics," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

8 F. Lecture to Sanitary Officers at 7 p.m. "Elementary Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

8 F. } 9 S. } Examinations in Practical Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Blackburn.

11 M. Lecture to School Teachers, at 7 p.m., "School Buildings, Water Supply, etc.," by J. Osborne Smith, F.R.I.B.A.

11 M. Lecture to Sanitary Officers at 7 p.m. "Elementary Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

13 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt., Public Health Dept., Borough of Islington.

13 W. Lecture—Sanitary Science Course, at 7 p.m. "Elementary Meteorology," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

15 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

15 F. Lecture to Sanitary Officers at 7 p.m. "Calculations, Measurements, and Plans and Sections," by W. C. Tyndale, M.INST.C.E.

15 F. } **Sessional Meeting,** NEWCASTLE-ON-TYNE, 7 p.m. "A Sketch of the Sanitary History of Newcastle-upon-Tyne, being a continuation of a paper read by Dr. H. E. Armstrong at the Congress of the Institute in Newcastle in 1882," by J. Coote Hibbert, M.D., D.P.H., and W. H. Wells.

16 S. } Visits to City Hospital, Rowton House, etc.

16 S. Demonstration—Meat Inspectors' Course, at 2 p.m.

16 S. Inspection and Demonstration at the Sewage and Destructor Works, Ealing, at 2.15 p.m. Conducted by Charles Jones, M.INST.C.E., Borough Engineer and Surveyor.

18 M. Demonstration in the Parkes Museum, at 6 p.m., Pipe Joints and Drain testing Appliances, by the Director, E. White Wallis, F.S.S.

18 M. Lecture to School Teachers at 7 p.m. "School Furniture," by Prof. H. R. Kenwood, M.B., D.P.H.

18 M. Lecture to Sanitary Officers at 7 p.m. "Building Materials," by A. Saxon Snell, F.R.I.B.A.

19 T. **Annual Meeting of Associates,** in the Parkes Museum, at 8 p.m. Address by Louis C. Parkes, M.D., D.P.H., on "The Training of Inspectors before taking Office."

20 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt. Public Health Department, Borough of Islington.

20 W. Demonstration in the Parkes Museum, at 6 p.m., on House Drainage, by the Director, E. White Wallis, F.S.S.

20 W. Lecture to School Teachers at 7 p.m. "Physical Exercises," by P. Boobbyer, M.D.

20 W. Lecture to Sanitary Officers at 7 p.m. "Sanitary Building Construction," by A. Saxon Snell, F.R.I.B.A.

22 F. Lecture—Sanitary Science Course, at 7 p.m. "Sanitary Building Construction" (Advanced), by A. Saxon Snell, F.R.I.B.A.

22 F.
23 S. } Examination for Inspectors of Meat and other Foods, Manchester.

23 S. Inspection and Demonstration in the Willesden Infirmary, at 3 p.m. Conducted by A. Saxon Snell, F.R.I.B.A.

25 M Lecture to Sanitary Officers at 7 p.m. "Sanitary Appliances," by W. C. Tyndale, M.INST.C.E.

29 F.
April
1 M. } **Easter Holidays.** Library and Museum closed.

APRIL.

24 W. **Ordinary General Meeting** at 4.30 p.m.

MAY.

15 W. **Annual Dinner.**

JUNE.

25—29 **Conference at Dublin.**

MEMBERS AND ASSOCIATES ELECTED,

JANUARY, 1907.

MEMBERS.

* Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

§ Marked thus have passed the Examination of the Institute in Hygiene in its bearing on School Life (Practical Hygiene for School Teachers).

2211 1907. Jan. *AYLING, John, *Coombe Road, Brighton.*

2196 1907. Jan. BELL, George Henry, 37, *Glanmor Crescent, Swansea.*

2212 1907. Jan. *BENNETT, Philip Sidney, 17, *Somerset Road, Ashford, Kent.*

2197 1907. Jan. BENTLEY, William, 468, *St. Helens Road, Bolton,*

2198 1907. Jan. DAVISON, Robert, B.E., ASSOC.M.INST.C.E., *City Surveyor's Office, City Hall, Belfast.*

2199 1907. Jan. DIXON, James A., M.R.C.V.S., *Veterinary Inspector, Leeds.*

2213 1907. Jan. *FEARNS, Frederick James, *Health Department, Acton, W.*

2200 1907. Jan. FLINN, D. Edgar, F.R.C.S., D.P.H., 10, *Lansdowne Road, Dublin.*

2201 1907. Jan. FRANK, Thomas Peirson, ASSOC.M.INST.C.E., P.A.S.I., *Elsinore, Vernon Road, Leeds.*

2214 1907. Jan. *GIBBARD, Ernest John, 37, *High Street, Wimbledon.*

2215 1907. Jan. *GREEN, Sidney George, 96, *Elgin Avenue, Maida Hill, W.*

2216 1907. Jan. *GREEN, William, 206, *Burnley Road, Accrington.*

2202 1907. Jan. HOLLINGWORTH, Wilfred, 190, *Waverley Road, New Beach, Toronto.*

2217 1907. Jan. *HOOPER, Leonard George, 54, *Charlotte Street, Morice Town, Devonport.*

2203 1907. Jan. KNAPMAN, William Ernest, *Pembroke Chambers, Barry, Glam.*

2219 1907. Jan.‡ § McKINNA, Alexander, 125, *George St., Edinburgh.*

2204 1907. Jan. ‡MATTHEWS, Robert Henry, 178, *High Road, South Tottenham, N.*

2218 1907. Jan. *MAUNDER. Norman, 1, *Vale Royal, Tunbridge Wells.*

2205 1907. Jan. MENMUIR, Robt. William, ASSOC.M.INST.C.E., P.A.S.I., *Town Engineer, Woodstock, Cape Colony.*

2206 1907. Jan. MEREDITH, Major John Alfred, F.R.C.V.S., 1st *Life Guards, Windsor.*

2220 1907. Jan. *MOULD, George, *Volksrust, Hamilton Road, Thornton Heath.*

2207 1907. Jan. OWEN, Joseph, 18, *St. Saviour's Road, Brixton Hill, S.W.*

2221 1907. Jan. *PITRE, Trimbak Janardan, *Sholapur, Bombay Presidency, India.*

2208 1907. Jan. REGO, Anthony Cajetan, *Asst. Engineer, Indian State Railway, Amritsar, Punjab, India.*

2209 1907. Jan. ROBERTSON, John, M.D., B.SC., (*M.O.H.*), *The Council House, Birmingham.*

2210 1907. Jan. SCOTT-DEAKIN, Walter, *Pride Hill, Shrewsbury.*

2222 1907. Jan. *STAINTON, William J., 41c, *Grand Parade, Harringay.*

2223 1907. Jan. *WORSSELL, James Lloyd, 66, *Patshull Road, Kentish Town.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.
M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.

4026 1907. Jan. ‡BAILEY, William, 136, *Bromley Road, Catford, S.E.*

4027 1907. Jan. ‡BAREHAM, Sidney John Harry, *Chilton Street, Clare, Suffolk.*

4028 1907. Jan. ‡BASSETT, Henry William, *Fernleigh, Mawney's Road, Romford.*

4029 1907. Jan. ‡BATES, George Herbert, *Ridge Bank, Todmorden.*

4030 1907. Jan. ‡BEAUMONT, John William, 146, *New Hey Road, Oakes, Lindley, Huddersfield.*

4031 1907. Jan. ‡BOND, Ernest Charles, *Edale, Newtown Road, Bedworth.*

4032 1907. Jan. ‡BRADFORD, Harry Colston, 36, *Brigstoke Road, Bristol.*

4033 1907. Jan. ‡BROWN, Joshua Wright. 2, *Cambridge Villas, Robinson Road, Tooting.*

4034 1907. Jan. ‡BULLEN, William Edward, *Saint Mary's Infirmary, Highgate Hill, N.*

4035 1907. Jan. ‡CHAPMAN, Herbert George, *Vernon House*, 19, *Albany Street, Regent's Park, N.W.*

4036 1907. Jan. ‡CHRISTIAN, John Christopher, 34, *Ravenscourt Gardens, Hammersmith, W.*

4037 1907. Jan. ‡CRABB, Percival Charles James, 13, *Borthwick Road, Stratford, E.*

4038 1907. Jan. ‡CRIPPS, Miss Fanny, 128, *Plymouth Grove, Manchester.*

4039 1907. Jan. ‡CULMER, George Giles, 5, *St. Anne's Road, Faversham, Kent.*

4040 1907. Jan. ‡CUNNINGHAM, William Meldrum, 68, *Acklam Road, Westbourne Park, W.*

4041 1907. Jan. ‡DICKINSON, Albert, "*Sundale,*" *Victoria Road, Southwick, Sussex.*

4042 1907. Jan. ‡Dinsdale, Thomas, *c/o H. M. Driver, Inspector of Nuisances, Garforth, near Leeds.*

4043 1907. Jan. ‡Edwards, Leslie Ernest, 7, *Gladstone Avenue, Wood Green, N.*

4044 1907. Jan. ‡Elsy, William Henry, *Surveyor's Office*, 12, *Avenue Chambers, Market Road, Chelmsford.*

4045 1907. Jan. ‡Flint, Ernest William, 33, *St. Albans Road, Seven Kings, Essex.*

4046 1907. Jan. ‡Freeman, Leonard, 8, *Queen's Road, Guildford.*

4047 1907. Jan. ‡French, Francis Harold, *Health Dept., Town Hall, Worthing.*

4048 1907. Jan. ‡Gomm, Miss Grace Evangeline, *District Nurse, Stoke-under-Ham, Somerset.*

4049 1907. Jan. ‡Hall, Pendril Blair, *Railway Surgery, Bloemfontein, Orange River Colony.*

4050 1907. Jan. ‡Halliday, John, 67, *Redcliffe Street, Keighley.*

4051 1907. Jan. ‡Harding, Walter Ernest, 76, *Holmesdale Road, Reigate.*

4052 1907. Jan. ‡Harris, Arthur Edward, 84, *Gladys Avenue, North End, Portsmouth.*

4053 1907. Jan. ‡Hayes, Robert Thomas, 16, *Birkbeck Grove, Acton, W.*

4054 1907. Jan. ‡Hill, Herbert Fox, 75, *New Road, Ware.*

4055 1907. Jan. *s* Hodgson, Miss Lilian, 30, *Alternberg Gardens, Clapham Common, S.W.*

4025 1907. Jan. Hooper, Edgar Wilfred, F.S.I., 15, *High Street, East Grinstead.*

4056 1907. Jan. ‡Hughes, Francis Edward, 70, *Wellington Road, Turton, near Bolton.*

4057 1907. Jan. ‡Jolley, William, 146, *Milton Street, Southport.*

4058 1907. Jan. ‡Jones, D. J., 62, *High Street, Llanelly.*

4059 1907. Jan. *s* Kanthack, Miss Emilia Victoria, "*Sherborne,*" *Mortlake Road, Kew.*

4060 1907. Jan. ‡Lawrence, Ernest H., "*Monoeda,*" 162, *Tulse Hill, S.W.*

4061 1907. Jan. ‡Lighbody, Thomas Henry, 3, *Newton Road, Risingholme Road, Wealdstone.*

4062 1907. Jan. ‡Lord, William Henry, 20, *Prinsloo Street, Pretoria, Transvaal, S.A.*

4063 1907. Jan. *s* Marshall, Miss Kate, 38, *St. Mary Abbott's Terrace, Kensington, W.*

4064 1907. Jan. ‡Martin, Cyril, *Port View, Looe, Cornwall.*

4065 1907. Jan. ‡Milburn, Edward E., 47, *West Percy Street, North Shields.*

4066 1907. Jan. ‡Miller, Miss Agnes Mabel, *Kelsall Lodge, Church Road, Leyton.*

4067 1907. Jan. ‡Newport, Reginald Charles Noel, 55, *Wilberforce Road, West Hendon, N.W.*

4068 1907. Jan. ‡Oram, Ebenezer George, 28, *Fieldhouse Road, Balham, S.W.*

4069 1907. Jan. ‡Ostle, Miss Mary, 86, *Cherry Street, Blackburn.*

4070 1907. Jan. ‡Painter, Thomas, "*The Laurels,*" *Lichfield Road, Brownhills, near Walsall.*

4071 1907. Jan. ‡Pearce, Harry Archibald, 33, *Brunswick Street, Walthamstow.*

4072 1907. Jan. ‡Panks, John Brandon, "*The Laurels,*" *Burgh Castle, Great Yarmouth.*

4073 1907. Jan. ‡Rampling, George Fred, *The Campbells, Sudbury, Suffolk.*

4074 1907. Jan. *s* Richardson, Miss Mary, 20, *East Parade, Newcastle-on-Tyne.*

4075 1907. Jan. *M* Roberts, Herbert Keeling, *The Mount, Church Stretton.*

4076 1907. Jan. ‡Rogers, George, *Watermoor, Cirencester, Glos.*

4077 1907. Jan. ‡Rooke, Harry Thomas, 3, *New Road, Ham Common, Richmond.*

4078 1907. Jan. ‡Scorrer, Edmund Holdridge, *Port Sanitary Inspector, Hull, Yorks.*

4079 1907. Jan. ‡Scott, William Henry, "*The Hollies,*" *Hallowell Road, Northwood.*

4080 1907. Jan. ‡Sharp, Harold Gibbon, *Richmond Lodge, Hessle, E. Yorkshire.*

4081 1907. Jan. ‡Staples, Miss Mary Elizabeth, 33, *Pollard Street, Middlesbro'.*

4082 1907. Jan. ‡Stevens, Miss Gladys E., *St. Lawrence Rectory, Southampton.*

4083 1907. Jan. ‡Sutherland, George A., 207, *Felsham Road, Putney, S.W.*

4084 1907. Jan. ‡Sutton, Miss Mary, 3, *Greaves Street, Great Harwood.*

4085 1907. Jan. ‡Thomas, Milton M., *Brostenlog House, Penydassin, Merthyr Tydfil.*

4086 1907. Jan. ‡Thurston, Harold William, 91, *Belmont Park Road, Leyton.*

4087 1907. Jan. ‡Watts, T. N. W., *Bell Street, Henley-on-Thames.*

4088 1907. Jan. ‡White, Robert, 61, *Quentin Road, Blackheath.*

4089 1907. Jan. ‡Wienholt, Miss Jessie Clementina, 1, *Palliser Court, W. Kensington, W.*

4090 1907. Jan. ‡Wright, Peter, 62, *Newton Street, Southport.*

4091 1907. Jan. ‡Wyld, James, 2, *Beaconsfield Road, Clayton, Yorks.*

SANITARY AND COLONIAL NEWS.

The Army Medical Advisory Board.

It is officially announced that the Secretary of State for War has approved of the amalgamation of the Army Medical Advisory Board and the Army Hospital and Sanitary Committee. The following are the members of the Advisory Board as now reconstituted:—

Chairman.

The Director-General, Army Medical Service.

Vice-Chairman.

The Deputy Director-General, Army Medical Service.

Members.

Lieut.-Colonel D. Bruce, C.B., F.R.S., M.B., R.A.M.C. (as Expert in Tropical Diseases).

Colonel G. K. Scott-Moncrieff, C.I.E., R.E., Assistant Director of Fortifications and Works.

Lieut.-Colonel C. H. Melville, M.B., R.A.M.C. (as Expert in Sanitation).

Civilian Members.

Sir Frederick Treves, Bart., F.R.C.S., LL.D., G.C.V.O., C.B.

J. Rose Bradford, D.Sc., M.D., F.R.S., Professor of Medicine, University College, London, and Physician to University College Hospital.

Louis Parkes, M.D., D P.H., Consulting Sanitary Adviser to H.M. Office of Works.

S. Pembrey, M.A.Oxon., M.D., Lecturer in Physiology, Guy's Hospital.

Sir Charles A. Cameron, C.B., M.D., Professor of Chemistry and Hygiene, Royal College of Surgeons, Ireland (for Sanitation in Ireland).

Representative of the India Office.

Surg.-General A. M. Branfoot, C.I.E. (retired Indian Medical Service).

Secretary.

Lieut.-Col. C. H. Melville, M.B., R.A.M.C.

South Africa.

At a meeting of the South African Association for the Advancement of Science, Mr. Arthur Reid, F.R.I.B.A., Chairman of the South African Board of Examiners of The Royal Sanitary Institute, read a paper on "Smoke Abatement in Mining and Manufacturing Centres."

In this paper Mr. Reid, dealing with the smoke nuisance which exists at Johannesburg, Capetown, and the mining and manufacturing centres around, attributes the primary cause of the nuisance to the present system of having so many steam-power installations for the working of the mines and industries, instead of installing a few large power houses; the electrical distribution of power, oil, hot-air, and internal-combustion gas engines naturally suggest themselves as remedies, and he eulogises the action of the Johannesburg Municipal Council in adopting the enormous gas engines for the generation of electric power for the municipal tramways and lighting schemes.

In considering an abnormal production of smoke in furnaces, he enumerates the following causes:—firstly, careless or ignorant stoking; secondly, the use of improper coal or fuel; thirdly, the use of obsolete or badly-designed fire boxes; fourthly, defective draught due to choked tubes or defective flues; fifthly, the want of scientific supervision of furnaces and boilers by the managing engineering staff.

He contends that a body such as the Coal Smoke Abatement Society of London should be immediately formed at Johannesburg, under the patronage and financial support of the gold mining companies and Chamber of Mines.

As a result of a series of questions issued to manufacturers and others by the Coal Smoke Abatement Society of London, with a view to ascertaining the causes of waste and the best means of counteracting the same, it appears that great importance should be attached to stoking, that great care should be exercised in the selection of suitable stokers; they should be conscientious men, who would save fuel by their care and intelligence, who had a knowledge of all classes of fuel, using the same economically, and seeing that bad coal was not supplied to their employers by interested colliery owners.

Mr. Reid suggests that their Chamber of Mines or some other interested body should follow the example of the Prussian Government, who, in 1902, arranged for a course of instruction for stokers and allowed £2,000 per annum for this purpose; as the promoter of this measure proved conclusively that serious waste had taken place through unscientific and careless stoking.

Reference is made to the work of the Hamburg Smoke Abatement Society, which has for its objects the attainment of the highest possible efficiency from heating and boiler plants with the least possible smoke. This society undertakes the education and control of firemen, and tests are made of fuel and appliances.

Mr Reid advocates the promoting of a similar course of instruction, etc., by the South African Association for the Advancement of Science, issuing certificates to trained men, and generally working to reduce the working costs of their mining, milling, etc., as well as to check a danger to the comfort and health of the community.

PARKES MUSEUM NEW PREMISES FUND.

	£	s.	d.
Amount Allotted by Council	9,000	0	0
Cash received in Donations, etc., 1899–1905 ...	1,167	11	6
Promises of Donations & Subscriptions, already reported to Dec. 31, 1906	1,181	1	0
Promises of Donations to the Douglas Galton Gallery	110	10	0

Contributions since last Report.

Miss M. A. Chappell	0	5	0
Dr. J. G. Victor Sapp (2nd donation)	2	2	0
Miss D. Stevens	0	5	0

Jan. 26th, 1907.

THE ROYAL SANITARY INSTITUTE.

ARTICLES RELATING TO PUBLIC HEALTH,*

Appearing in the chief British and Foreign Journals and Transactions.

Abstracts of Titles classified in this List under the following headings:—

Science in Relation to Hygiene and Preventive Medicine.
Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.
Building Materials, Construction, and Machinery.
Water Supply, Sewerage, and Refuse Disposal.
Heating, Lighting, and Ventilating.
Personal and Domestic Hygiene.

The articles referred to in this list are as far as possible collected and filed in the Library of the Institute for the use of the Members and Associates.

Science in relation to Hygiene and Preventive Medicine.

Berry, H. Poole, M.R.C.S. The Persistency of the Infection in Certain Cases of Scarlet Fever. *Lancet*, Jan. 12th, 1907, p. 88.

History of cases is given to illustrate point of paper.

Paterson, Marcus S., M.B., B.S.Durh. The Sterilisation of Tuberculous Sputum and Articles Infected by the Tubercle Bacillus. *Lancet*, Aug. 18th, 1906, p. 426.

Gives descriptions of methods and illustrations of apparatus.

Posnett, W. G. Tottenham, F.R.C.S.I. Ankylostome Parasitism among the Native Labourers in the Transvaal. *Lancet*, Sept. 15th, 1906, p. 718.

Particulars are given of observations which are claimed to be the first to demonstrate the existence of ankylostome infection among the natives of the Rand.

Raw, Nathan, M.B. Human and Bovine Tuberculosis. *British Medical Journal*, Aug. 18th, 1906, p. 357.

Gives evidence in support of the opinion that the two diseases are distinct varieties, but that the human body is susceptible to both.

Shackleton, W. W., M.D.Dub. The Prophylactic Use of Anti-diphtheritic Serum. *Lancet*, Sept. 15th, p. 722.

Gives an account of the success which attended the use of anti-diphtheritic serum as a prophylactic in a school containing over 300 boys.

* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

STEVEN, J. LINDSAY, M.D. Epidemic Cerebro-spinal Fever, with Illustrative Cases. *Lancet*, Sept. 8th, 1906, p. 638.

Title sufficiently indicates scope.

WRIGHT, W., M.D., D.P.H., and ARCHIBALD, W., M.B., D.P.H. The Infectivity of Enteric Fever, *British Medical Journal*, June 9th, 1906, p. 1338.

History of seven cases are given, six in one house and one in "next close," in support of the infectivity.

Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.

BLAKE, E. H., F.S.I. Some Notes on Sanitary Law. *Building News*, Nov. 30th, 1906, p. 749.

Sanitary Acts affecting the Metropolis—Those affecting the Country—Duties of Authorities under the Acts—Chief points of drainage by-laws—Definitions—References to cases.

COMMITTEE. Report of Education Committee of the London County Council. *Builder*, June 16th, 1906, p. 673.

Report with tables showing cost of several schools; also cost per place.

EDITOR OF "THE BUILDER." Sanitary State of Non-provided Schools. *Builder*, Dec. 29th, 1906, p. 746.

Comment upon the L.C.C. condemnation of 267 non-provided schools, and the Bishops' appeal for £50,000 to bring them up to the required standard.

HAMILTON, R. M., A.R.I.B.A. Domestic Architecture in Western Australia. *Journal of R.I.B.A.* Nov. 10th, 1906, p. 20.

Plans and descriptions of small houses adapted for the climate of Australia.

HIORNS, FRED. R., A.R.I.B.A. Modern Town Halls of France. Part I. *Journal of R.I.B.A.*, December 8th, 1906, p. 61.

Plans, elevations, sections, and details of the Hôtel de Ville, Paris, with descriptive letterpress.

REID, GEO., M.D., D.P.H. Infantile Mortality and the Employment of Married Women in Factory Labour before and after Confinement. *Lancet*, Aug. 18th, 1906, p. 423.

Statistics are given to show the effect of the practice of mothers working in factories upon the infantile mortality.

TEALE, T. PRIDGIN, F.R.S. King's College Hospital: A Retrospect. *Journal of R.I.B.A.*, Oct. 20th, 1906, p. 534.

An address, at the opening of the session at King's College, upon hospital accommodation in the last century, with special reference to King's College Hospital, old and new.

Water Supply, Sewerage, and Refuse Disposal.

BRYCE, JOHN, A.M.Inst.C.E. Some Sanitary Problems incident to Populous Centres. *Surveyor*, Sept. 14th, 1906, p. 331.

Free open space around habitable buildings—Sewage disposal—Refuse disposal—Road dust.

DIBDIN, W. J., F.I.C., F.C.S. Sewage Disposal, with Special Reference to Improvements in Primary Contact Beds. *Surveyor*, July 6th, 1906, pp. 4, 5.

Composition of sewage—Agencies available for separation of matter.—Various processes for treatment of sewage—Sludge—Principle of aërobic contact bed—Slate beds—Results.

DUDFIELD, R., M.D. Ventilation of Sewers. *Builder*, June 16th, 1906, p. 682.

Advocating the abolition of "dead ends," or the ventilating of them, to remove the nuisance of surface ventilators.

"ENGINEERING RECORD." The Sterilization of Sewage-Filter Effluents. Jan. 19th, 1907, p. 75.

Effect of lime, acids, ozone, chlorine, oxychloride, chloride of lime, copper, and miscellaneous.

ELLMS, JOSEPH, W. Sulphate of Iron and Caustic Lime as Coagulants in Water Purification. *Engineering Record*, Oct. 20th, 1906, p. 439.

Record of five years' experiments in purifying turbid waters.

KERSHAW, JOHN, F.I.C. The Production and Cost of Ozonized Air for the Sterilization of Potable Waters. *Surveyor*, Aug. 31st, 1906, pp. 264–65; Sept. 7th, 1906, pp. 290–91.

Various ozonizers described—Ozone waterworks (illustrated).

REID, GEORGE, M.D. Nitrification of Sewage. *Building News*, Aug. 10th, 1906, p. 182.

Shallow filters—L. G. B.'s regulations—Size of filter particles—Results from analyses.

DAVIES, S. H., and FRYER, F. G. The Removal of Dust and Smoke from Chimney Gases. *Engineering*, Aug. 17th, 1906, p. 220.

Description of plant installed at York—Quality of coal—Method for washing the gases—Annual expenses increased by the installation.

Heating, Lighting, and Ventilation.

HUBBARD, CHARLES L. The Warming and Ventilation of Hospitals. *Engineering Record*, Oct. 13th, 1906, p. 411.

General description of American practice.

——— The Warming and Ventilation of Churches, Halls, and Theatres. *Engineering Record*, Dec. 29th, 1906, p. 724.

Brief general description of the use of fans and heaters.

SWINBURNE, J., F.R.S., M.Inst.C.E. House Illuminants. *Engineering*, Nov. 30th, 1906, p. 720.

House heating—Ventilation and power for small houses—Diagrams of candle-power per hour for different illuminants—Renewals—Cost, etc.

Personal and Domestic Hygiene.

CHALMERS, A. K., M.D., D.P.H. The Increase of the Power of Local Authorities with regard to Milk-supply. *Lancet*, Aug. 18th, 1906, p. 425.

The scope of the paper does not admit of general summary.

MCCLEARY, G. F., M.D., D.P.H. The Public Supply of Pure or Specially Prepared Milk for the Feeding of Infants. *Lancet*, Aug. 18th, 1906, p. 422.

Advocates the provision of Municipal Milk Depôts, with certain restrictions and extensions.

WRIGHT, WM., M.D., D.P.H. Infantile Mortality and Goat's Milk. *Lancet*, Nov. 3rd, 1906, p. 1212.

Advocates the use of goat's milk as being cleaner, safer from point of view of tuberculosis, more nearly resembling human milk, and no characteristic flavour if fed on meadow grass.

MEETINGS HELD.

SESSIONAL MEETINGS.

Stafford.—The meeting was held in the County Council Offices, on Saturday, February 16th, when a discussion on "To what extent must Authorities Purify Sewage" was opened by George Reid, M.D., D.P.H., County Medical Officer, Staffordshire C.C. The chair was taken by Col. J. Lane Notter, M.A., M.D., Chairman of Council. A visit was made to the Hanley Sewage Disposal Works.

EXAMINATIONS.

The following Examinations have been held :—

Sanitary Science as applied to Buildings and Public Works.

February 8th and 9th, Glasgow. 1 Candidate; Certificate granted.
February 22nd and 23rd, Hull. 1 Candidate; no Certificate granted.

Inspectors of Nuisances.

February 8th and 9th, Glasgow. 7 Candidates; 2 Certificates granted.
February 22nd and 23rd, Hull. 35 Candidates; 13 Certificates granted.

Hygiene in its bearing on School Life.

December 3rd & 5th, Hong Kong. 11 Candidates; 4 Certificates granted.

Candidates who have received Certificates.

Sanitary Science as applied to Buildings and Public Works.

Macdonald, Alexander Simpson.

Inspectors of Nuisances.

Brown, Annie McKenzie.
Butterfield, Henry Ambler.
Clayton, John.
Duncan, Ethel Maude Mary.
Eastwood, Charles William.
Gee, George Edward.
Graham, Oscar.
Hancock, Thomas.
Lancaster, Alice Maud.
Lynch, Ernest R.
McHattie, George Thomas.
Seymour, Harry William.
Shaw, George Frederic.
Wildridge Charles Robert.
Wilson, Bernard.

Hygiene in its bearing on School Life.

Curwen, William.
Hee, Young.
Morris, Alfred.
Parkin, John Charles.

FORTHCOMING MEETINGS.

Lecture to the Institute.

London, Friday, March 1st, at 5.30 p.m., by Professor Ronald Ross, C.B., D.Sc., F.R.C.S., F.R.S., on "Points of Interest connected with Tropical Sanitation," illustrated by Lantern Slides.

Sessional Meetings.

London, Saturday, March 2nd. At 11 a.m., Discussion on "The Bacterial Treatment of Sewage, with special reference to Biolysis of Organic Nitrogen," to be opened by W. D. Scott-Moncrieff. At 3 p.m., Visit to Staines Sewerage Works at Ashford.

Newcastle, Friday, March 15th. At 7 p.m., "A Sketch of the Sanitary History of Newcastle-upon-Tyne, being a continuation of a paper read by Dr. H. E. Armstrong at the Congress of the Institute in Newcastle in 1882," by J. Coote Hibbert, M.D., D.P.H., and W. H. Wells.

Saturday, March 16th.—Visits to City Hospital for Infectious Diseases; Royal Victorian Infirmary; All Saints' Church; Rowton House; and the Corporation Tramways Power Station.

London, Tuesday, April 9th, At 8 p.m., Discussion on "Aim and Scope of Women's Work in relation to Public Health," by H. Meredith Richards, M.D., B.Sc., Medical Officer of Health, Croydon.

Annual Meeting of Associates.

London, Tuesday, March 19th, in the Parkes Museum, at 8 p.m. Address by Louis C. Parkes, M.D., D.P.H., on "The Training of Inspectors before taking Office."

Conference at Dublin, 1907.

A Conference for the discussion of Sanitary and Public Health Questions has been arranged to be held in Dublin from June 25th to 29th, 1907.

Facilities will also be given to Delegates and Members to attend the Irish International Exhibition in Dublin, which will be in progress during the Conference.

Patron: His Excellency the Rt. Hon. the Earl of Aberdeen, Lord Lieutenant of Ireland.

President: The Right. Hon. the Earl of Rosse, K.P., J.P., D.C.L., F.R.S., Chancellor of the University of Dublin.

Section I.—Sanitary Science and Preventive Medicine—
President: Sir Charles Cameron, C.B., M.D., D.P.H.

Section II.—Engineering and Architecture—
President: P. C. Cowan, B.Sc., M.Inst.C.E.

Section III.—Physics, Chemistry, Biology, and Meteorology—
President: Sir John W. Moore, M.D., D.Sc., F.R.C.P.I.

Hon. Secretaries: W. Kaye-Parry, M.Inst.C.E., F.R.I.B.A., M.A.
Surg.-Col. D. Edgar Flinn, D.P.H., F.R.C.S.I.

Examinations.

In Sanitary Science as applied to Buildings and Public Works,
Inspectors of Nuisances, and
In Hygiene in its Bearing on School Life—
Blackburn, March 8th and 9th.
Worcester, April 5th and 6th.
Dublin, April 12th and 13th.

For Inspectors of Meat and Other Foods—
Manchester, March 22nd and 23rd.

Students' Lectures.

Practical Training for Meat Inspectors.

for candidates preparing for the Examination for Inspectors of Meat and Other Foods, conducted by The Royal Sanitary Institute.

The Eleventh Course will commence on March 1st, and will consist of systematic Practical Training in the Inspection of Meat at a Cattle Market, including Demonstration on live cattle and sheep, slaughtering and dressing of animals, names and situations of the organs, diseases of animals, methods of stalling, arrangements of markets and byres, etc., and will include the Lectures on Meat and Food Inspection given in the Parkes Museum.

Special Course on Food and Meat Inspection.

Fifth Special Course of Practical Training in Food and Meat Inspection for Commissioned Officers and Professional Students preparing for the Examination for Inspection of Meat and other Foods, conducted by The Royal Sanitary Institute, will commence on April 25th.

The dates and subjects of the Lectures and Demonstrations in each Course are given month by month in the Calendar.

Calendar, March and April, 1907.

As far as at present arranged.

Council Meetings are held Monthly on the Second Wednesday in each Month at 5 p.m.

Exhibition Committee . . Congress and Editing Committee	Monday in the week preceding the Council, at 4.30 p.m. & 5.30 p.m.
Examination Committee . . Museum and Library Committee	Tuesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Special Purposes Committee . Finance Committee . . .	Wednesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Parliamentary Committee . . New Premises Committee . . Disinfectant Standardisation Committee	As occasion requires.

The Parkes Museum is open free, on Mondays 9.30 a.m. to 8 p.m., other days 9.30 a.m. to 5.30 p.m. The Library and Office are closed at 1 p.m. on Saturdays.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

MARCH.

1 F. **Lecture to the Institute,** at 5.30 p.m., by Professor Ronald Ross, C.B., D.SC., F.R.C.S., F.R.S., on "Points of Interest connected with Tropical Sanitation," illustrated by Lantern Slides.

1 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

1 F. Lecture to Sanitary Officers at 7 p.m. "Elementary Physics," by E. J. Steegmann, M.B., M.R.C.S., D.P.H., M.O.H., Heston and Isleworth.

2 S. **Sessional Meeting,** LONDON, at 11 a.m. Discussion on "The Bacterial Treatment of Sewage, with special reference to the Biolysis of Organic Nitrogen," to be opened by W. D. Scott-Moncrieff. At 3 p.m., Visit to the Staines Sewage Works at Ashford.

2 S. Inspection and Demonstration at the Battersea Disinfecting Station, Mortuary, and Shelter, at 2.15 p.m. Conducted by G. Quin. Lennane, F.R.C.S., L.R.C.P., D.P.H., M.O.H., Battersea.

5 T. Demonstration of Book-keeping as carried out in a Sanitary Inspector's Office, at the Public Health Office, Town Hall, Upper St., Islington, N., at 7 p.m., by James R. Leggatt, Supt. Public Health Dept., Borough of Islington.

6 W. Lecture to Sanitary Officers at 7 p.m. "Elementary Physics," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

8 F. Lecture to Sanitary Officers at 7 p.m. "Elementary Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

8 F. 9 S. Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Blackburn.

9 S. Demonstration—Meat Inspectors' Course, at 2 p.m.

11 M. Lecture to School Teachers, at 7 p.m., "School Buildings, Water Supply, etc.," by J. Osborne Smith, F.R.I.B.A.

11 M. Lecture to Sanitary Officers at 7 p.m. "Elementary Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

13 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt., Public Health Dept., Borough of Islington.

13 W. Lecture—Sanitary Science Course, at 7 p.m. "Elementary Meteorology," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

15 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

15 F. Lecture to Sanitary Officers at 7 p.m. "Calculations, Measurements, and Plans and Sections," by W. C. Tyndale, M.INST.C.E.

15 F. **Sessional Meeting,** NEWCASTLE-ON-TYNE, 7 p.m. "A Sketch of the Sanitary History of Newcastle-upon-Tyne, being a continuation of a paper read by Dr. H. E. Armstrong at the Congress of the Institute in Newcastle in 1882," by J. Coote Hibbert, M.D., D.P.H., and W. H. Wells.

16 S. Visits to City Hospital for Infectious Diseases; Royal Victorian Infirmary; All Saints Church; Rowton House; and the Corporation Tramways' Power Station.

16 S. Demonstration--Meat Inspectors' Course, at 2 p.m.

16 S. Inspection and Demonstration at the Sewage and Destructor Works, Ealing, at 2.15 p.m. Conducted by Charles Jones, M.INST.C.E., Borough Engineer and Surveyor.

18 M. Demonstration in the Parkes Museum, at 6 p.m., Pipe Joints and Drain testing Appliances, by the Director, E. White Wallis, F.S.S.

18 M. Lecture to School Teachers at 7 p.m. "School Furniture," by Prof. H. R. Kenwood, M.B., D.P.H.

18 M. Lecture to Sanitary Officers at 7 p.m. "Building Materials," by A. Saxon Snell, F.R.I.B.A.

19 T. **Annual Meeting of Associates,** in the Parkes Museum, at 8 p.m. Address by Louis C. Parkes, M.D., D.P.H., on "The Training of Inspectors before taking Office."

20 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt. Public Health Department, Borough of Islington.

20 W. Demonstration in the Parkes Museum, at 6 p.m., on House Drainage, by the Director, E. White Wallis, F.S.S.

20 W. Lecture to School Teachers at 7 p.m. "Physical Exercises," by P. Boobbyer, M.D.

20 W. Lecture to Sanitary Officers at 7 p.m. "Sanitary Building Construction," by A. Saxon Snell, F.R.I.B.A.

22 F. Lecture—Sanitary Science Course, at 7 p.m. "Sanitary Building Construction" (Advanced), by A. Saxon Snell, F.R.I.B.A.

22 F. } 23 S. } Examination for Inspectors of Meat and other Foods, Manchester.

23 S. Inspection and Demonstration in the Willesden Infirmary, at 3 p.m. Conducted by A. Saxon Snell, F.R.I.B.A.

25 M Lecture to Sanitary Officers at 7 p.m. "Sanitary Appliances," by W. C. Tyndale, M.INST.C.E.

29 F. **Good Friday.** Library and Museum closed.

APRIL.

1 M. **Easter Monday.** Library and Museum closed.

5 F. Lecture—Meat Inspectors' Course, 6.30 p.m.

5 F. } 6 S. } Examinations in Sanitary Science as applied to Building and Public Works, for Inspectors of Nuisances, and in Hygiene in its Bearing on School Life, Worcester.

8 M. Demonstration in the Parkes Museum, at 6 p.m. Water Supply, by the Director, E. White Wallis, F.S.S.

8. M. Lecture to Sanitary Officers at 7 p.m. "Ventilation," by A. Saxon Snell, F.R.I.B.A.

9 T. **Sessional Meeting,** Parkes Museum, at 8 p.m. Discussion on "The Aim and Scope of Women's Work in relation to Public Health," to be opened by H. Meredith Richards, M.D.

10 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt., Public Health Dept., Borough of Islington.

10 W. Lecture to Sanitary Officers at 7 p.m. "Details of Plumbers' Work," by J. Wright Clarke.

24 W. **Annual General Meeting** at 4.30 p.m. in the Parkes Museum.

MAY.

15 W. **Annual Dinner.**

JUNE.

25—29 **Conference at Dublin.**

AUGUST.

5—14 **International Congress and Exhibition on School Hygiene, London.**

MEMBERS AND ASSOCIATES ELECTED.

FEBRUARY, 1907.

MEMBERS.

*** Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.**

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

2224 1907. Feb. BJERRE, Aage, *Lyngby, Copenhagen, Denmark.*

2225 1907. Feb. *COLLINS, A. W., 14, *Albert Road, Peckham.*

2226 1907. Feb. HAVARD, David, M.D., D.P.H., *East View, Newport R.S.O., Pembrokeshire.*

2227 1907. Feb. MCKAY, Blair, ASSOC.M.INST.C.E., *Engineer and Surveyor, Cottesloe, W.A.*

2228 1907. Feb. MCKENZIE, W. Hector, *Municipal Buildings Bournemouth.*

2229 1907. Feb. ‡STOCKMAN, F. C., "*Winifred,*" *Lambert Road, North Finchley, N.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

4092 1907. Feb. ‡ANDREWS, George Albert, 32, *Spring Gardens, Rodwell, Weymouth.*

4093 1907. Feb. ‡BENNETT, Frederick Guy, *The Ferns, Staple Hill, near Bristol.*

4094 1907. Feb. ‡BRADFORD, Harry Colston, 36, *Brigstock Road, Bristol.*

4095 1907. Feb. ‡COCKS, P. Gerald, 87, *Cicada Road, Wandsworth Common, S.W.*

4096 1907. Feb. ‡DUNCAN, R., *Sanitary Inspector, Hong Kong, China.*

4107 1902. Nov. ‡HUNT, W. J. L., *Richmond House, Richmond Road, Southampton.*

4097 1907. Feb. ‡JENNINGS, Frank Thomas Steele, 77, *Henry Street, Bloemfontein.*

4098 1907. Feb. ‡KING, Henry, 33, *Como Road, Forest Hill, S.E.*

4099 1907. Feb. ‡MCIVER, Alexander, *Plumber, Johannesburg, Transvaal.*

4100 1907. Feb. ‡SAUNDERS, Percy, 1, *Barnet Villas, Barnet Street, Cape Town.*

4101 1907. Feb. ‡SHORLAND, Cecil, H. G., *Petworth House, Bath.*

4102 1907. Feb. ‡TRESIDDER, Marshall George Hamilton, *Broad Street, Penryn.*

4103 1907. Feb. ‡WADE, George Matthew, 2, *Wellington Place, Richmond, Yorks.*

4104 1907. Feb. ‡WATTS, George, *Stantonbury House, Corston, Somerset.*

4105 1907. Feb. ‡WILLIAMS, Ernest, 51, *Glenmore Avenue, Stoke, Devonport.*

4106 1907. Feb. ‡WOOD, Harry, *Public Offices, Barking, Essex.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.*

*** *For Publications of Societies and Institutions, etc., see under "Academies."*

ACADEMY (AMERICAN).

Washington. *American Institute of Architects.* Proceedings of the Thirty-ninth Annual Convention. 253 pp., 4to. Washington, 1906. *The Institute.*

ACADEMY (BRITISH).

London. *Institution of Civil Engineers.* Minutes of Proceedings, with other selected and abstracted papers. Vol. CLXVI. 469 pp., 8vo. London, 1906. *The Institution.*

Bashore, *H. B.* Outlines of Practical Sanitation: for Students, Physicians, and Sanitarians. 198 pp., 8vo. New York, 1906. *The Publishers (J. Wiley & Sons).*

Board of Agriculture and Fisheries. Agricultural Statistics, 1906. Vol. XLI., Part I. Acreage and Live Stock Returns of Great Britain, with summaries for the United Kingdom. 87 pp., 8vo. London, 1906. *The Board.*

British Guiana. Report of the Commission appointed to inquire into and report upon the General and Infantile Mortality; together with minutes of sittings, evidence of witnesses, etc. 154 pp., fcap. Georgetown, 1906. *Luke M. Hill, B.E., M.Inst.C.E.*

Digby, *W. Pollard, F.S.S., A.M.I.E.E., and* **Shenton,** *H. C. H., M.S.E.* Prevention of the Bacterial Contamination of Streams and Oyster Beds, read before the Society of Engineers. 26 pp., 8vo. London, 1906. *H. C. H. Shenton, M.S.E.*

Factories and Workshops. Illustrations of Methods of Dust Extraction, compiled by Commander Sir Hamilton P. Freer-Smith, R.N. 93 pp., fcap. London, 1906. *B. A. Whitelegge, C.B., M.D.*

Geological Survey. Summary of progress of the Geological Survey of the United Kingdom and Museum of Practical Geology for 1905. 204 pp. (plates), 8vo. London, 1906. *His Majesty's Government.*

Jephson, *H., L.C.C.* The Sanitary Evolution of London. Price 6s. 433 pp., 8vo. London, 1907. *T. Fisher Unwin (publisher).*

Katrak, *N. N.* Notes on the proposed duplication of the Tansa Main and the Bombay Water Supply generally. 49 pp., 8vo. Bombay, 1906. *The Author.*

Local Government Board. Dr. F. St. George Mivart's report on the sanitary circumstances and administration of the Bourne Rural District and the prevalence of scarlatina and diphtheria therein during 1905. No. 247. 16 pp., fcap. London, 1906.

——— Dr. S. Monckton Copeman's report on an outbreak of enteric fever at the Belmont Asylum for Imbeciles, Sutton, Surrey. No. 248. 15 pp., fcap. London, 1906.

——— Dr. G. S. Buchanan and Dr. S. B. Schryver's report on the changes in certain meat essences kept for several years in tins. No. 1. 11 pp., fcap. London, 1906. *W. H. Power, C.B., F.R.S.*

——— Dr. J. Spencer Low's Report on the Sanitary Circumstances and Administration of the Bridport Rural District. No. 249. 9 pp., fcp. London, 1906. *W. H. Power, C.B., F.R.S.*

*** Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.**

London County Council. Report of the Education Committee submitting the report of the Medical Officer (Education) for the year ended 31st March, 1906. 52 pp., fcap. London, 1906. *James Kerr, M.A., M.D., D.P.H.*

——— Report of the Public Health Committee submitting the Report of the Medical Officer of Health of the County for the year 1905. Fcp. London, 1906. *Sir Shirley Murphy.*

London, *City of. Public Health Department.* Meat Inspection at the Central Market. Report, Medical Officer of Health for the City of London (W. Collingridge, M.A., M.D.) 18 pp., fcap. London, 1906. *W. Collingridge, M.A., M.D.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, December, 1906 .. .. *Matthew Hay, M.D.*
Durham C.C., 1905 .. .. .. *T. Eustace Hill, M.B., B.Sc., F.I.C.*
Huddersfield, 3rd Quarter of 1906.. *S. G. Moore, M.D., D.P.H.*
Nottingham (Meteorology), 1906 .. *P. Boobbyer, M.D., M.O.H.*

Pratt, E. A. Licensing and Temperance in Sweden, Norway, and Denmark. 114 pp., 8vo. London, 1907. *J. Murray (publisher).*

Rideal, *S., D.Sc.Lond., F.I.C.* Sewage and the Bacterial Purification of Sewage. Price 16s. 348 pp., 8vo. London, 1906. *The Sanitary Publishing Co., Ltd.*

Royal Commission on Tuberculosis (Human and Bovine). Second interim Report of the Royal Commission appointed to inquire into the relations of Human and Animal Tuberculosis. Part I. Report. 98 pp., fcp. London, 1907. *Purchased.*

Salisbury, Rhodesia. Minute of His Worshipful the Mayor for the year ending August 1st, 1906. 29 pp., fcap. Salisbury, 1906. *J. P. Horsfield.*

Savage, *W. G., B.Sc., M.D., D.P.H.* The Bacteriological Examination of Water-supplies. 291 pp., 8vo. London, 1906. *The Publisher (H. K. Lewis).*

Shelly, *C. E., M.A., M.D., and* **Stenhouse,** *E., B.Sc.* A Health Reader. 160 pp., 8vo. London, 1906. *Macmillan & Co. (publishers).*

Transvaal. Report of the Rand Water Board to the Colonial Secretary of the Transvaal. 61 pp., fcp. Johannesburg, 1906.

——— *Rand Water Board.* Description of Scheme for additional Supply. 6 pp., 4to. Johannesburg, 1906. *D. Calder Leitch, M.Inst.C.E.*

Vernon-Harcourt, *L. F., M.A., M.Inst.C.E.* Sanitary Engineering with respect to Water-supply and Sewage Disposal. 419 pp., 8vo. London, 1907. *The Publishers (Longmans, Green, & Co.)*

Wandsworth. Report of the Metropolitan Borough Council for the year ended 31st March, 1906, to which is appended the Annual Report of the Medical Officer of Health for 1905. 518 pp., 8vo. London, 1906. *The Council.*

Wood, Drew, & Co. Water Supply: Statement relating to the transfer of the metropolitan water undertakings and analysis of the accounts of some of the principal provincial water undertakings for the year 1905–06. 31 pp., 4to. London, 1906. *The Compilers (Wood, Drew, & Co.)*

LIST OF EXHIBITS ADDED TO MUSEUM.

Gully Trap. The "Lambeth" pattern, having facility for inspecting and scraping the drain. Small water area and deep water seal. Trap and arm of earthenware. Galvanized iron hinged grating and screw cover in frame secured with brass screws.

Intercepting Trap. "Clero" pattern, having cascade action and easy outgo. Cap to clearing eye set at an angle of 15° to floor level of chamber, and provided with iron ring for hook or chain attachment.

Reekie & Sons, Brecknock Rd., N.

Incandescent Gas Mantles. "Luddite" pattern. *E. Mitchell, Ely Place, E.C.*

Pipe Brackets, Sockets, and Flanges. "Hercules" pattern, for securing lead soil or other pipes. *C. Thomerson, Hackney Rd., N.*

Sewage Distributor. "Fiddian's" rotary type (detail drawings and lantern slides); consisting of an elongated water wheel, which revolves on a radial arm, and has connected with it wheels running on a roller track round the filter bed. The sewage effluent is conveyed to the water wheel, causing it to revolve and travel over the surface of the filter bed.

Birch Killon & Co., Manchester.

SANITARY AND COLONIAL NEWS.

New Zealand.

Sir J. E. Ward, Prime Minister, New Zealand, and the Honble. Geo. Fowlds, Minister of Public Health of the Colony, have consented to serve on the Board of Examiners for New Zealand.

As a matter of sanitary interest, we note that the money for a crematorium in Wellington, N.Z., has been collected, and that the City Council promised to start the building before the end of 1906.

South Africa.

Mr. R. O. Wynne Roberts, M.Inst.C.E., has, in consequence of giving up his appointment as Water Engineer to the Corporation of the City of Cape Town, resigned his seat on the Board of Examiners for British South Africa.

Western Australia.

The following additions have recently been made to the Board of Examiners of the Institute for Western Australia:—

Dr. T. H. Lovegrove, President of the Central Board of Health;

Dr. J. B. Cleland, Government Bacteriologist and Pathologist; and

Mr. J. B. Allen, B.Sc., Lecturer to the Technical College, Perth.

A Course of Lectures is being held preparatory to the Examination, which it is proposed to hold in April.

Hong Kong.

The first Examination in Hong Kong in Hygiene in its bearing on School Life was held on December 3rd and 5th, 1906, and particulars will be found on page 20. This is the first Colonial Centre to which this Examination has been extended.

International Congress for Hygiene and Demography.

The Fourteenth International Congress for Hygiene and Demography will be held in Berlin, from the 23rd to the 29th of September, 1907, to the work of which Her Majesty the Empress of Germany has most graciously accorded her high protectorship.

The fee for membership is fixed at £1 (20 marks). The work of the Congress will be distributed among eight sections, and the subjects proposed for discussion therein and the Presidents are the following:—

Section I.—*Hygienic Microbiology and parasitology.*
President: Professor Flügge.

Etiology of tuberculosis; the bacilli of the typhoid group; the cocci of meningitis and similar bacteria; etiology of syphilis; etiology of yellow fever; pathogenic protozoa; pathogenic spirochaetae; report on the methods of testing sera; modern proceedings of immunisation.

Section II.—*Dietetic Hygiene, Hygienic Physiology.*
President: Professor Rubner.

Report on the present legislative measures concerning foodstuffs and the control of the same in different countries; means used for the preservation of foodstuffs; requirements of the legislation on foodstuffs; the diet of the poor and its effect on social economy; the necessary minimum of albumen; alcoholism; bathing and its eeffcts on health.

Section III.—*Hygiene of Childhood and Schools.*
President: Professor Keubner.

Care of infants, school children, youths; the infant homes and their results; extension lectures on infantile hygiene as means of raising the profession of midwifery; production of pure milk for infants; the system of school physicians; the question of overwork in schools; best regulation of holidays.

Section IV.—*Professional Hygiene and Care of the Working Classes.*
President: Professor Renk.

Fatigue through work; review on the success of preventive measures against accidents; hygienic instruction for inspectors of industries; dwelling-houses for workmen; public baths; baths in factories; industrial lead-poisoning; prevention of dust in industries; new experiences; the dangers of electricity, and assistance in case of accidents caused by strong currents; how to reduce the dangers to health in home industry; the question of ankylostoma; substitution of a harmless procedure for the tanning by mercury.

Section V.—*Combating Infectious Diseases and Care of the Sick.*
President: Professor Gaffky.

Uniform regulation of the methods of testing disinfecting apparatus and disinfectants; control of disinfection; insurance against disease and its sanitary effects; combating tuberculosis, care of consumptives; preventive inoculation against typhoid fever, plague, cholera; combating epidemic meningitis; spread and combating of plague; the new methods of combating typhoid fever; measures for preventing the spread of infection by vaccinated individuals; compulsory meat inspection with reference to prevention of disease.

SECTION VI.—(*A*) *Hygiene of Dwellings, Townships, and Waters.*

President: PROFESSOR GRUBER.

Provision of dwellings for the poor; homes for unmarried persons; report on the effect of the mechanical, chemical, biological purification of sewage; up-to-date experiences on the separate system; utilisation and removal of sewage sludge; influence of clarified sewage upon the condition of rivers; new methods of filtering drinking-water; ozonising of water; experiences on water collected by valley dykes; modern appliances for lighting and their hygienic importance; importance of artificial ventilation; smoke nuisance in large towns.

(*B*) *Hygiene of Traffic.*

President: DR. SCHWECHTEN.

Professional diseases in connection with traffic; supervision of food supply for travellers; the danger of epidemic diseases, and their prevention in the railway service; concerning the dangers resulting from the employment in the railway service of persons affected with nervous complaints; injuries incurred in the railway travelling, and their prevention.

SECTION VII.—*Military, Colonial, and Naval Hygiene.*

President: PROFESSOR KERN.

Water supply for an army in the field; reports on inoculation against typhoid fever in the army; how to judge of the fitness of officers and men for active service in tropical countries; removing waste in military camps and in the field; wholesale poisoning of troops by adulterated food; physical condition of the soldier in relation to tuberculosis and functional heart disease; ships infested with plague rats; sleeping sickness; malaria campaign; ventilation of ships of the navy and mercantile marine; vaccination against smallpox in the colonies; on sanatoria in the tropics; the campaign against yellow fever; perpetual sanitary supervision of ports; lavatories, baths, water-closets on board of ships of war; regulation of the bodily temperature and the difficulties which are opposed to in the naval service and in the tropical countries; sunstroke, convulsions of the stokers, isolation; combating of infectious diseases on board.

SECTION VIII.—*Demography.*

President: DR. VAN DER BORGHT.

Death tables, (*a*) German empire, (*b*) Prussia, (*c*) large towns; report on duration of life of the population, special report concerning the German nation; infant mortality, (*a*) method of statistics on infant mortality, (*b*) food and its influence, control of milk supply, (*c*) mother's nursing according to the statistics of Baden; statistics of plural births; statistics of families; statistics of marriages between relatives; statistics of recruiting; inland migration; emigration and immigration; school hygiene and statistics; morbidity and mortality of different professions; form for statistics of the causes of disease and death; mortality and wealth; statistics of persons affected with corporal or mental defects (the deaf, blind, insane) as well as of cripples; statistics and supervision of dwellings; paper on life insurances; paper on statistics of workmen's insurance against accident or invalidity.

Full particulars of the meeting can be obtained of the Secretary General, DR. NIETNER, Eichhornstr. 9, Berlin 9 W.

International Congress of Gouttes de Lait.

The Second International Congress of "Gouttes de Lait"—Protection of Child Life—will be held in Brussels from the 12th to the 16th of September, 1907.

The Meeting is to be under the High Protectorship of their Royal Highnesses the Prince and Princess Albert of Belgium, and under the Presidency of Messieurs A. Beernaert and J. le Jeune, Ministers of the State.

Among the subjects arranged for discussion are the following:—

Are the "Gouttes de Lait" and other institutions for the protection of infant-life satisfactory means for the prevention of tuberculosis, and can they be considered as forming the first necessary step in the solution of the problem of the prevention of tuberculosis?

An account of the legislation of the different countries concerning the control of the production and distribution of milk. Special stress will be laid in the papers on the measures taken in certain towns for the control of infants' milk.

Description of institutions of different countries for the prevention of infantile mortality.

Exact statistics of infantile mortality in each country.

The regulation of infant feeding: (1) breast feeding; (2) artificial feeding.

Study of digestion in infancy (glandular appendages of the alimentary canal, intestinal flora, fæces, etc.).

The different milks used in artificial feeding, and the indications for their use.

Practical and rapid clinical methods of analysing milks.

Instruction in the hygiene of infancy by official and private agencies, and its popularisation in different countries.

Full particulars of the Meeting can be obtained of the General Secretary, Dr. Eugene Lust, rue de la Sémité 27, Brussels.

NEW PREMISES FUND.

	£	s.	d.
Amount Allotted by Council	9,000	0	0
Cash received in Donations, etc., 1899–1906 ...	1,338	19	0
Promises of Donations & Subscriptions, already reported to Dec. 31, 1906	1,009	13	6
Promises of Donations to the Douglas Galton Gallery	110	10	0
Contributions, 1907, already reported	2	12	0

Contributions since last Report.

Miss L. H. Arnold (2nd donation)	0	10	6
H. Blackman	1	1	0
A. Fort	0	10	6
F. W. King (3rd donation)	1	1	0
F. W. Miller (2nd donation)	0	10	6

Feb. 25th, 1907.

THE ROYAL SANITARY INSTITUTE.

MEETINGS HELD.

Lecture to the Institute.

London.—A Lecture was given on Friday, March 1st, at 5.30 p.m., by Professor Ronald Ross, C.B., D.Sc., F.R.S., on "Points of Interest connected with Tropical Sanitation," and illustrated by Lantern Slides. The chair was taken by the President, His Grace The Duke of Northumberland.

Sessional Meetings.

London.—The Meeting was held in the Parkes Museum on Saturday, March 2nd, at 11 a.m., when a Discussion on "The Bacterial Treatment of Sewage, with special reference to Biolysis of Organic Nitrogen" was opened by W. D. Scott-Moncrieff. The chair was taken by Col. J. Lane Notter, M.D., D.P.H., R.A.M.C. A visit was made to the Staines Sewerage Works.

Newcastle.—The Meeting was held in the Town Hall, on Friday, March 15th, at 7 p.m., when a Discussion was opened on "A Sketch of the Sanitary History of Newcastle-upon-Tyne, being a continuation of a paper read by Dr. H. E. Armstrong at the Congress of the Institute in Newcastle in 1882," by J. Coote Hibbert, M.D., D.P.H., and W. H. Wells. The chair was taken by Col. J. Lane Notter, M.D., D.P.H., R.A.M.C.

On Saturday, March 16th, visits were made to the City Hospital for Infectious Diseases and the Royal Victorian Infirmary.

Annual Meeting of Associates.

London.—The meeting was held in the Parkes Museum, on Tuesday, March 19th, at 8 p.m., when an address was delivered by Louis C. Parkes, M.D., D.P.H., on "The Training of Inspectors before taking Office," followed by a general discussion on the subject.

Examinations.

The following Examinations have been held :—

Sanitary Science as applied to Buildings and Public Works.

Dec. 14th & 15th, Sydney. 2 Candidates; 2 Certificates granted.
March 8th and 9th, Blackburn. 7 Candidates; 1 Certificate granted.

Hygiene in its bearing on School Life.

March 8th and 9th, Blackburn. 11 Candidates; 4 Certificates granted.

Inspectors of Meat and other Foods.

March 22nd & 23rd, Manchester. 13 Candidates; 5 Certificate granted.

Inspectors of Nuisances.

Dec. 14th & 15th, Sydney. 9 Candidates; 2 certificates granted.
March 8th & 9th, Blackburn. 27 Candidates; 10 Certificates awarded.

Candidates who have received Certificates.

Sanitary Science as applied to Buildings and Public Works.

Hull, John Thomas. McCook, Frank. Walters, Julius Ludwig.

Inspectors of Nuisances.

Bardsley, Cecil William.
Barrett, Hartley.
Bleakley, Ralph.
Dibblin, Leslie Herbert.
Dixon, Thomas Percival.
Jackson, Edward Marshall.
Langhorn, Robert.
Perry, George Edgar.
Robinson, Thomas Gordon.
Schofield, James Herbert.
Shorrock, James Francis.
Weedon, Charles.

Hygiene in its bearing on School Life.

Anderton, Sarah.
Harris, Mary Treverton.
Mortimer, Florence.
Shipley, Gertrude.

Inspectors of Meat and other Foods.

Hanson, Frederick.
Lambe, Percy Rodolph.
Levie, Alexander.
Stableforth, William Parkinson.
Whitehead, Joseph Donaldson.

FORTHCOMING MEETINGS.

Sessional Meetings.

London, Tuesday, April 9th, at 8 p.m. Discussion on "Aim and Scope of Women's Work in relation to Public Health," by H. Meredith Richards, M.D., B.Sc., Medical Officer of Health, Croydon.

Eastbourne, Saturday, May 18th. Discussion on "The Main Drainage of Eastbourne," by A. E. Prescott, Borough Engineer and Surveyor, Eastbourne.

Ordinary General Meeting.

The Ordinary General Meeting will be held in the Parkes Museum, on Wednesday, April 24th, at 4.30 p.m.

Conference at Dublin, June 25th to 29th, 1907.

A list of the sections and officers was given in the March issue of the Journal, and the following subjects for discussion have now been arranged:—

Section I.—

"Poor Law and Sanitary Administration in Ireland." Opened by Sir Charles A. Cameron, C.B., M.D., F.R.C.P.I., D.P.H., Ph.D.

"The Role of Sanatoria as a Factor in checking Tuberculosis." Opened by Professor E. J. McWeeney, M.A., M.D., D.P.H.

Section II.—

"The Economic Housing of the Working Classes in Town and Country." Opened by P. C. Cowan, B.Sc., M.Inst.C.E.

"Could the existing Statutory and Departmental Requirements as to Sewage Disposal be relaxed in certain cases with advantage to the Community?" Opened by W. Kaye-Parry, M.A., M.Inst. C.E., F.R.I.B.A.

Section III.—

"The Climatology of Ireland in relation to Public Health." Opened by Sir William John Moore, M.D., D.P.H., M.R.I.A., D.L., M.Ch., F.R.C.P.I.

"Disinfection considered from a Medical, Chemical, and Bacteriological standpoint." Opened by S. Rideal, D.Sc., F.I.C.

A Full Programme of the Conference will be given in the May issue of the Journal.

Examinations.

In Sanitary Science as applied to Buildings and Public Works,
Inspectors of Nuisances, and
In Hygiene in its Bearing on School Life—

Worcester, April 5th and 6th.
Dublin, April 12th and 13th.
Liverpool, April 26th and 27th.
Edinburgh, May 3rd and 4th.
London, May 24th and 25th.
Hong Kong (Sanitary Science and Inspectors of Nuisances).

Inspectors of Meat and Other Foods—

Hong Kong, April.
Belfast, April 19th and 20th.
Edinburgh, May 10th and 11th.
London, May 31st and June 1st.

CALENDAR, APRIL AND MAY, 1907.

As far as at present arranged.

Council Meetings are held Monthly on the Second Wednesday in each Month at 5 p.m.

Exhibition Committee . . Congress and Editing Committee	Monday in the week preceding the Council, at 4.30 p.m. & 5.30 p.m.
Examination Committee . . Museum and Library Committee	Tuesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Special Purposes Committee . Finance Committee . . .	Wednesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Parliamentary Committee . . New Premises Committee . . Disinfectant Standardisation Committee	As occasion requires.

The Parkes Museum is open free, on Mondays 9.30 a.m. to 8 p.m., other days 9.30 a.m. to 5.30 p.m. The Library and Office are closed at 1 p.m. on Saturdays.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

APRIL.

1 M. **Easter Monday.** Library and Museum closed.

5 F. Lecture—Meat Inspectors' Course, 6.30 p.m.

5 F., 6 S. Examinations in Sanitary Science as applied to Building and Public Works, for Inspectors of Nuisances, and in Hygiene in its Bearing on School Life, Worcester,

8 M. Demonstration in the Parkes Museum, at 6 p.m. Water Supply, by the Director. E. White Wallis, F.S.S.

8. M. Lecture to Sanitary Officers at 7 p.m. "Ventilation," by A. Saxon Snell, F.R.I.B.A.

9 T. **Sessional Meeting,** PARKES MUSEUM, at 8 p.m. Discussion on "The Aim and Scope of Women's Work in relation to Public Health," to be opened by H. Meredith Richards, M.D.

10 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt., Public Health Dept., Borough of Islington.

10 W. Lecture to Sanitary Officers at 7 p.m. "Details of Plumbers' Work," by J. Wright Clarke.

12 F. Lecture to Sanitary Officers at 7 p.m. "House Drainage," by W. C. Tyndale, M.INST.C.E.

12 F., 13 S. Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Dublin.

13 S. Demonstration—Meat Inspectors' Course at 2 p.m.

13 S. Inspection and Demonstration at Sewage Works, Sutton, Surrey, at 3 p.m. Conducted by C. Chambers Smith, Town Surveyor.

15 M. Lecture to Sanitary Officers at 7 p.m. "Water," by A. Wellesley Harris, M.D.

17 W. Inspection and Demonstration at the East London Soap Works, at 3 p.m. Arranged by Messrs. E. Cook & Co., Ltd.

17 W. Lecture to School Teachers at 7 p.m. "Physical Conditions," by J. Kerr, M.D.

19 F. Lecture—Meat Inspectors' Course at 6.30 p.m.

19 F. Lecture to Sanitary Officers at 7 p.m. "Sewerage," by J. E. Worth, M.INST.C.E.

19 F. } 20 S. } Examination for Inspectors of Meat and Other Foods, Belfast.

20 S. Inspection and Demonstration at Morden Hall Dairy Farm, Morden, Surrey, at 3 p.m. Conducted by Oscar J. White.

22 M. Lecture to Sanitary Officers at 7 p.m. "Sewage Disposal," by J. E. Worth, M.INST.C.E.

24. W. Inspection and Demonstration at the East London Waterworks, Lea Bridge, Clapton, at 3 p.m. Conducted by Mr. Blackburn, Deputy Engineer.

24 W. **Annual General Meeting** at 4.30 p.m. in the Parkes Museum.

24 W. Lecture to School Teachers. at 7 p.m. "Physical Conditions," by James Kerr, M.D.

24 W. Lecture to Sanitary Officers at 7 p.m. The Hygiene of Byres, Lairs, Cowsheds, and Slaughterhouses, and all places where animals destined for the supply of food are kept, and the Hygiene of Markets, Dairies, and other places where food is stored, prepared, or exposed for sale, and transported, by E. Petronell Manby, B.A., M.D., D.P.H.. Medical Inspector, L.G.B.

24 W. Lecture to Sanitary Officers at 7 p.m.

25 Th. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m. "Meat Inspection." by James King, M.R.C.V.S.

25 Th. Lecture to Sanitary Officers at 7 p.m. The Laws, By-laws, and Regulations affecting the inspection and sale of Meat and other articles of Food, including their preparation and adulteration, by E. Petronell Manby, B.A., M.D., D.P.H., Medical Inspector, L.G.B.

26 F. Lecture to Sanitary Officers at 7 p.m. "Signs of Health and Disease in Animals," by W. Hunting, F.R.C.V.S.

26 F. } 27 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its Bearing on School Life, Liverpool.

27 S. Demonstration—Meat Inspectors' Course at 2 p.m.

29 M. Lecture to Sanitary Officers at 7 p.m. "The Names and Situations of the Organs of the Body in Animals," by W. Hunting, F.R.C.V.S.

30 T. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m.. "Meat Inspection," by James King, M.R.C.V.S.

MAY.

1 W. Inspection and Demonstration at Harrison & Barber's Knackers' Yard, Winthrop Street, Whitechapel, E., at 3 p.m. Conducted by R. Glover, F.R.C.V.S., Veterinary Inspector, County Borough of West Ham.

1 W. Lecture to Sanitary Officers at 7 p.m. "Practical Methods of Stalling and Slaughtering Animals," by W. Hunting, F.R.C.V.S.

2 Th. Diseased Meat, with a Demonstration of Morbid Specimens collected from Meat Markets, at 7 p.m., by James King, M.R.C.V.S.

3 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

3 F. } 4 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and on Hygiene in its bearing on School Life, Edinburgh.

4 S. Inspection and Demonstration at the Sewage Outfall Works, Barking, at about 3 p.m. Conducted by John Edward Worth, M.INST.C.E., District Engineer, London County Council.

4 S. Demonstration on Meat Inspection to Commissioned Officers and Professional Men at Metropolitan Cattle Market, at 3 p.m., by James King, M.R.C.V.S.

15 W. **Annual Dinner,** at the Langham Hotel, when the President, His Grace the Duke of Northumberland, K.G., will take the chair.

JUNE.

25—29 **Conference at Dublin.**

AUGUST.

5—14 **International Congress and Exhibition on School Hygiene, London.**

MEMBERS AND ASSOCIATES ELECTED,

MARCH, 1907.

MEMBERS.

2230 1907. Mar. ALLAN, Sir Montague, *"Ravenscrag," Montreal, Canada.*

2231 1907. Mar. BUIST, Major Herbert John Martin, R.A.M.C., *The Junior United Service Club, Charles Street, S.W.*

2232 1907. Mar. CALDWELL, Lieut.-Col. Robert, F.R.C.S., D.P.H., R.A.M.C., *Royal Army Medical Corps, Devonport.*

2233 1907. Mar. ELKINGTON, J. S. C., M.D., D.P.H., J.P., *Chief Health Officer for Tasmania, Hobart, Tasmania.*

2234 1907. Mar. ELLIOTT, Charles Roulston, M.D., D.P.H., 12, *Waterloo Place, Wellington Road, Cork.*

2235 1907. Mar. FRERE, Robert Mylcraine, M.D., C.M., *North-Western Fever Hospital, Lawn Road, Hampstead, N.W.*

2236 1907. Mar. LOWE, Thomas Henry, 10, *Rue Lebeau, Brussels.*

2237 1907. Mar. MACCARTHY, Brendon, M.D., D.P.H., *Clooney Park, Londonderry.*

2238 1907. Mar. OGDEN, Abraham Buckley, *Davyhulme, Urmston, Manchester.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.
§ Marked thus have passed the Examination of the Institute in Hygiene in its bearing on School Life (Practical Hygiene for School Teachers).

4108 1907. Mar. BEENY, Mrs. Catherine Matilda, *Brunswick House, Clifton Gardens, Maida Vale, W.*

4110 1907. Mar. ‡BROWN, Miss Annie McKenzie, 36, *Shore Street, Gourock, N.B.*

4111 1907. Mar. ‡DENBY, Frederick, 228, *Battersea Park Road, S.W.*

4112 1907. Mar. ‡DUNCAN, Miss Ethel Maude Mary, *c/o Pasmore & Son,* 82, *King's Road, S.W.*

4118 1904. Feb. ‡HEYWOOD, Miss A., *Sanitary Office, Lancaster.*

4113 1907. Mar. ‡JOHNSON, Miss Ethel Gertrude Monica, 8, *Drakefield Road, St. Catherine's Park, S.E.*

4114 1907. Mar. ‡KINCH, Stanley A., *Pine Villa, King's Road, Walton-on-Thames.*

4115 1907. Mar. §‡LANCASTER, Miss Alice Maud, 62, *Revidge Road, Blackburn.*

4116 1907. Mar. ‡MCHATTIE, George Thomas, 2, *Stephen Street, Jarrow.*

4117 1907. Mar. ‡SEYMOUR, Harry William, *West Street, Alford, Lincs.*

4109 1907. Mar. WILLIAMS, Miss May G., 60, *Burton Court, S.W.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.*

Factories and Workshops. Supplement to the annual report of the Chief Inspector for the year 1905: Return of persons employed in 1904 in workshops and laundries. 7 pp., fcap. London, 1907.

——— Preliminary tables of cases of industrial poisoning and fatal accidents in factories and workshops, etc., during the year 1906. 7 pp., fcap. London, 1907. *A. Whitelegge, C.B., M.D., B Sc.*

Galbraith, *A. R., A.M.Inst.C.E.I.* Iron, Steel, and Concrete Construction (le béton armé). Part I.—Early history, materials, theory, and practical formulæ. Part II.—Description of the principal systems, with examples. 59 pp., 8vo. Dublin, 1906.

——— Reinforced Concrete Piling. 20 pp. (plates), 8vo. London, 1906. *The Author.*

Keetley, *C.B., F.R.C.S.* The prevention of Cancer, and its relation to that of some other diseases and calamities. 38 pp., 8vo. London, 1907. *The Publishers (Baillière, Tindall, & Cox).*

Knight, *J., M.D., D.P.H.* An analysis of the infantile mortality of Scarborough for the thirty years 1876–1905, with recommendations. 22 pp., 4to. Scarborough, 1907. *The Author.*

Local Government Board. Dr. S. Monckton Copeman's report on the general sanitary circumstances and administration of the County Borough of Wigan, with special reference to infantile mortality, and to endemic prevalence of enteric fever and diarrhœa. No. 246. 22 pp., fcap. London, 1907.

——— Dr. W. W. E. Fletcher's report upon the sanitary circumstances and administration of the Chester-le-Street Rural District. No. 250. 30 pp., fcap. London, 1907.

——— Report on the Micrococcus of epidemic cerebro-spinal meningitis and its identification, by Dr. M. H. Gordon. 24 pp., fcap. London, 1907. *W. H. Power, C.B., F.R.S.*

London. Manual for the Royal Army Medical Corps, 1904. 164 pp., 8vo. London, 1904. *Purchased.*

——— The Nomenclature of Diseases, drawn up by a Joint Committee appointed by the Royal College of Physicians of London. Fourth edition, being the third revision. 496 pp., 8vo. London, 1906. *Purchased.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, January, 1907	*Matthew Hay, M.D.*
Chelmsford, 1906	*J. C. Thresh, D.Sc., M.D., D.P.H.*
Chiswick (Sanitary Inspectors, 1906)	*John H. Clarke, M.R.San.I.*
Durban, year ending 31st July, 1906	*P. Murison, M.D., B.Sc., D.P.H.*
Johannesburg, from July 1st, 1904–June 30th, 1906	*Charles Porter, M.D., D.P.H.*
Kingston-upon-Hull, Four weeks ended 26th January, 1907 ..	*J. Wright Mason, M.B., D.P.H.*
London, City of, from 17th November to 31st December, 1906; from 1st to 12th January, 1907 ..	*W. Collingridge, M.A., M.D., D.P.H.*

* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

Longton, 1906	.. .. ..	*J. W. Dawes, M.B., C.M.*
Maldon, 1906	.. .. ..	*J. C. Thresh, D.Sc., M.D., D.P.H.*
Montreal, 1905	.. .. ..	*L. Laberge, M.O.H.*
Rothwell, 1906	.. .. ..	*R. Stevenson. L.R.C.P.. L.R.C.S.*
S. Thomas, 1906	.. .. ..	*M. Farrant, M.R.C.S., D.P.H.*
Wakefield, 1906	.. .. ..	*J. R. Kaye, M.B., D.P.H.*
Weymouth & Melcombe Regis, 1906		*W. B. Barclay, D.P.H.*
Yeovil, 1904, 1905, and 1906	..	*H. Page, M.D., D.P.H.*

Registrar-General. Sixty-eighth annual report of the Births, Deaths, and Marriages in England and Wales, 1905. 451 pp., 8vo. London, 1907.
The Registrar-General.

Tropical Diseases Research Fund. Report of the Advisory Committee for the year 1906. 56 pp., fcap. London, 1907. *Purchased.*

Washington. Report of the Commissioner of Education for the year ending June 30th, 1904. Volume 2. 2,452 pp., 8vo. Washington, 1906.
The Commissioner.

LIST OF EXHIBITS ADDED TO MUSEUM.

Two Sample Stoneware Aërating Tiles, for bacteria beds.
H. R. Mansfield, Burton-on-Trent.

"Torrent" pattern Formaldehyde Vapour Disinfecting Apparatus, suitable for large rooms, etc. *R. W. Greiff & Co.,* 20, *Eastcheap, E.C.*

"Carlyle" type Wash-down Pedestal Closet, with extended inlet arm, and lugs for fixing seat.

Brass Thimble Socket, for connecting closet to lead soilpipe.

Small Fan, for use in w.c., etc.; clockwork motion.
John Jones (Chelsea) Ltd., Carlyle Works, Chelsea, S.W.

NEW PREMISES FUND.

	£	s.	d.
Amount Allotted by Council	9,000	0	0
Cash received in Donations, etc., 1899–1906 ...	1,338	19	0
Promises of Donations & Subscriptions, already reported to Dec. 31, 1906	1,009	13	6
Promises of Donations to the Douglas Galton Gallery	110	10	0
Contributions, 1907, already reported	6	5	6

Contributions since last Report.

	£	s.	d.
J. H. Catchpole (2nd donation)		10	6
A. C. Cole		10	6
Alderman William Dunk	1	1	0

March 25th, 1907.

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

OUTLINES OF PRACTICAL SANITATION.*

The first important illustration in this book shews a section of a house with interior plumbing and drainage upon a system which offends most of our cherished canons of drain construction. W.c.'s, baths, washhand basins, all empty into a common pipe passing down through the house interior—not even against an outside wall—to a house drain running close beneath the basement. We are told that the valve closet is only of historic interest, and that the wash-down and wash-out patterns are now generally used. The valve closet (of modern type) is certainly still often used in this country, and the wash-out has been given up—except perhaps in hospitals and other places where it is necessary to preserve stools for inspection—because, on account of the broken flow of water, this pattern of closet-pan is not self-cleansing. The illustration of the two latter types of closet which the book contains, moreover, are out of date: they both shew a soil-pipe junction (with the pan) below the floor level.

Further on we are told that "the trouble caused by deficient ventilation is brought about mostly by lack of O and increase of CO_2, although other factors are probably at work to bring about the result." This, of course, is an under-statement of the (causative) part played by the tertium quid. With the exception of one or two defects of this character, the sections on heating and ventilation are well written and instructive.

The subject of water supplies is generally well treated, but some of the illustrations are more picturesque than instructive. The amount of the public water supply written off as loss or waste in the United States is given as averaging one-third of the total amount used—surely an excessive quantity. A good deal of space is devoted to the subject of water pollution and filtration, and the testing of water for impurities, and we are told that drinking-water should be soft, and free from animal impurities; but no allusion is made to the plumbo-solvent action of soft waters containing vegetable acids, and the consequent danger of delivering such water through leaden service-pipes.

The section on sewage and sewage disposal is short, but instructive and up-to-date, although some of the filtering methods described would probably not find acceptance with English sewage-disposal experts.

The disposal of solid refuse apparently gives rise to even greater difficulty and inconvenience than with us. The refuse destructors in use in the United States have usually horizontal instead of sloping grates, which must add greatly to the difficulty of successful stoking. The cost of burning refuse, too, is for some reason much greater than in this country. In New York we are told it amounts to a dollar a ton. Owing to the wasteful habits of American people in dealing with their foods, we learn that it pays the local authorities to extract the grease from house refuse before cremating it.

The author writes very strongly, but very sensibly, upon the subject of milk-production and storage, and the adulteration and contamination of milk. Cleanliness and chilling are advocated, but no mention is made of sterilization by heat.

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* Outlines of Practical Sanitation for Students, Physicians, and Sanitarians. By Dr. Harvey B. Bashore, Inspector for Pennsylvania Department of Health. New York: John Wiley & Sons; London: Chapman & Hall, Ltd. 1906.

Emphasis is laid upon the large amount and specially dangerous quality of the dust of towns, and the practice of exposing all manner of food-stuffs sold in shops and markets to its contaminating influence, is very justly condemned.

The adulteration of foods is touched upon, and we are informed that during 1904 the Food Commissioner of the State of Pennsylvania "collected over 35,000 dollars (£7,000) in fines, from those who were violating the law by selling adulterated food and milk" in that State alone. We learn that sodium sulphite —a drug believed to exert a specially injurious influence upon the kidneys, when taken in repeated doses—is largely used in the States for the preservation of Hamburg steak, bologna, canned asparagus, etc.

The writer very rightly insists upon the special importance of all that relates to the hygiene of school life, and gives a foremost place to ventilation. We are told that a medical examination of school children is now made daily in many of the large cities in the States.

The prevailing very general neglect of sanitation in railway- and tram-cars is touched upon, and several points illustrating this neglect are adduced. The danger of allowing human excreta to be strewn along the railway lines is indicated, and the substitution of pail-closets on the cars for the existing shoots strongly urged.

The chapter on infectious diseases contains useful information, for the most part up-to-date, but in this place, as elsewhere in the book, there is a good deal of loose writing. We are told, for example, that scarlet fever patients should be isolated "for at least a week after complete recovery"!

Some excellent rules for combating the spread of tuberculosis are given, and here, in the practical application at any rate of well-recognized theories, our American cousins are probably ahead of us.

In discussing, under "Vital Statistics," the value of birth registration, the author makes no mention of the obvious fact that the prompt registration of births, if properly utilized by health authorities, is of great assistance to them in checking infantile mortality.

In speaking of the degree of prevalence of enteric fever as a criterion of sanitary progress, the writer expresses the opinion that the mortality of this disease may be greatly lessened by treatment, an opinion certainly not borne out by experience this side of the Atlantic.

In the chapter on Municipal Sanitation we have a terrible picture of slum-life in New York (Manhattan Island)—nearly 2,000 persons to an acre, the thickest, blackest mass of humanity in the world—appalling death-rate, especially among infants—some authorities claiming that half the tenement population of New York is more or less tuberculous. It is a relief to learn later on that well-planned and well-built modern tenements of only six storeys are springing up in Brooklyn, New York, and elewhere, to take the place of the hideous rookeries that have so long been a blot on city life in the States.

Public scavenging appears to be well done for the most part, but the smoke problem in all large centres of population has yet to be dealt with in the United States, as with us.

There are useful hints upon rural hygiene, including private water-supplies, and the disposal of refuse, solid and liquid.

The book concludes with a chapter on personal hygiene, a good deal of which, as the author truly says, may be summed up under the head of Simple Living.

This small work contains much good and useful information, and, but for the too frequent blemishes referred to in this notice, might be recommended as an excellent popular introduction to the subject of Public Health. P. B.

ARTICLES RELATING TO PUBLIC HEALTH,*

Appearing in the chief British and Foreign Journals and Transactions.

Abstracts of Titles classified in this List under the following headings:—

Science in Relation to Hygiene and Preventive Medicine.
Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.
Building Materials, Construction, and Machinery.
Water Supply, Sewerage, and Refuse Disposal.
Heating, Lighting, and Ventilating.
Personal and Domestic Hygiene.

The articles referred to in this list are as far as possible collected and filed in the Library of the Institute for the use of the Members and Associates.

Science in relation to Hygiene and Preventive Medicine.

DIVINE, THOMAS, M.B., D.P.H. Some social factors in the causation of Infantile Mortality. *Lancet*, 21st July, 1906, p. 142.

The effect on infantile mortality of the three factors (1) married woman employment, (2) overcrowding, and (3) high birth-rate, is discussed.

KOCH, PROF. R. How the fight against Tuberculosis now stands. *Lancet*, May 26th, 1906, p. 1449.

The remedies suggested are notification, hospitals, sanatoriums, dispensaries or "care stations," combined with improved hygienic surroundings and efforts to educate the people regarding precautions to be observed.

SHRUBSALL, F. C., M.D. A few suggestions for the future of Consumptive Patients of the Working Classes. *Lancet*, 28th July, p. 217.

Paper does not admit of short summary.

Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.

BLANC, HIPPOLYTE J. Bangour Village Lunatic Asylum. *Builder*, 10th November, 1906, p. 544.

Description of buildings with plans and elevations, and site plan.

HIOLUS, FRED. R., A.R.I.B.A. Modern Town Halls of France—Parts II. and III. *Journal R.I.B.A.*, 22nd December, 1906, p. 126; 12th January, 1907, p. 141.

Plans and illustrations, with descriptive letterpress, of two typical *mairies* of Paris.

Plans and illustrations, and descriptive letterpress, of the Hôtel de Ville, Versailles.

SCOTT, A. ALBAN H. A Note on Housing of the Working Classes. *Builder*, 8th September, 1906, p. 300.

Describing model dwellings, with the disadvantages, and suggestions for improvements—considerations of cost.

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* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

Takaki, Baron, F.R.C.S., D.C.L. The Preservation of Health amongst the Personnel of the Japanese Navy and Army. *Lancet*, 19th and 26th May, 1906, pp. 1369 and 1451.

The title indicates the scope.

Tayler, A. S., and Jemmett, A. R. Tottenham Municipal Buildings. *Builder*, 14th April, 1906, p. 409.

3 plans, 3 photographs, and description of buildings opened November, 1905.

Building Materials, Construction, and Machinery.

"Builder." A Concrete-Steel Failure in America. 16th June, 1906, p. 667.

Statement of causes of failure, after an examination of materials following the disaster.

Dibdin, W. J., F.I.C. The Composition and Strength of Mortar. *Journal R.I.B.A.*, 22nd December, 1906, p. 101.

It shows the results of experiments made with various kinds of sand in lime mortar mixed in proportions given in the L.C.C. by-laws, compared with results obtained by mortar purposely made in direct contradiction to the by-laws.

Dunn, William. The Composition and Strength of Mortar. *Journal R.I.B.A.*, 12th January, 1907, p. 166.

It shows results of experiments made with various kinds of sand and Portland cement.

Water Supply, Sewerage, and Refuse Disposal.

Bryan, Wm. B., M.Inst.C.E. Water Supply. *Surveyor*, 9th November, 1906, p. 532-533.

Historical sketch of ancient supplies—similarity of various usages of the present day with those of the ancients—London's water supply—great improvements in machinery in recent years—statistics of London's supply.

"Builder." Water Supply. 10th November, 1906, p. 530.

Comment upon the presidential address delivered at the Junior Institution of Engineers, dealing with the development of water supply from ancient times.

Collins, W. D. Notes on Water Softening. *Engineering Record*, 16th February, 1907, p. 173.

A paper read before the Indiana Engineering Society, the matter being the result of an attempt to find a method of water analysis which might be used by an engineer or other person without chemical training to determine the treatment necessary to soften a hard water.

Digby, W. Pollard, and Shenton, H. C. H. Prevention of the Bacterial Contamination of Streams and Oyster Beds. *Surveyor*, 7th and 14th December, 1906, pp. 653 and 685.

Royal commission report—principles of sewage disposal—sterilization—history of application of hypochlorite solutions—electrolytic production of sodium hypochlorite—cost of application—and apportionment of cost.

MEETINGS HELD.

Sessional Meetings.

London.—The meeting was held in the Parkes Museum on Tuesday, March 9th, at 8 p.m., when a discussion on "The Aim and Scope of Women's Work in relation to Public Health," was opened by H. Meredith Richards, M.D., B.Sc., Medical Officer of Health, Croydon. The chair was taken by Col. J. Lane Notter, M.D., D.P.H., R.A.M.C.

The Ordinary General Meeting was held in the Parkes Museum on April 24th, Col. J. Lane Notter R.A.M.C., presiding.

The following were elected :—

As Vice-Presidents.

Right Hon. Earl Egerton of Tatton.
Right Hon. Earl Stamford.
Right Hon. Lord Avebury, P.C., D.C.L., F.R.S.
Sir Joseph Fayrer, Bart., K.C.S.I., LL.D., M.D., F.R.S.
Sir Francis Sharp Powell, Bart., M.P.
Sir Benjamin Baker, K.C.B., K.C.M.G., LL.D., F.R.S., M.Inst.C.E.
Sir William Henry Preece, K.C.B., F.R.S., M.Inst.C.E.
Sir Alexander Binnie, M.Inst.C.E.
Sir Shirley Murphy.
Sir Aston Webb, R.A., F.R.I.B.A.
Right Hon. Robert Farquharson, P.C., LL.D., M.D.
A. Wynter Blyth, Barrister-at-Law, M.R.C.S., F.I.C.

As New Members of Council. (Eight to be elected.)

Henry Adams, M.Inst.C.E.
T. W. Aldwinckle, F.R.I.B.A.
D. S. Davies, M.D., D.P.H.
Lieut.-Col. A. S. Jones, V.C., M.Inst.C.E.
W. Kaye-Parry, M.A., M.Inst.C.E.
John Slater, F.R.I.B.A.
Sir Henry Tanner, I.S.O., F.R.I.B.A.
E. Walford, M.D., D.P.H.

As Treasurer.

Thomas W. Cutler, F.R.I.B.A.

As Auditors.

W. Collinridge, M.A., M.D., LL.B., D.P.H.
Wood, Drew & Co.

The Report of the Council will be given in the Supplement for June.

Examinations.

The following Examinations have been held :—

Sanitary Science as applied to Buildings and Public Works.

April 5th and 6th, Worcester. 1 candidate; 1 certificate granted.

Inspectors of Nuisances.

April 5th and 6th, Worcester. 6 candidates; 2 certificates granted.
April 12th & 13th, Dublin. 6 candidates; 1 certificate granted.

Hygiene in its bearing on School Life.

April 5th and 6th, Worcester. 1 candidate; no certificate granted.

CANDIDATES WHO HAVE RECEIVED CERTIFICATES.

Sanitary Science as applied to Buildings and Public Works.
MUGFORD, JOHN SIDNEY.

Inspectors of Nuisances.
CHILTON, ALBERT FREDERIC HANMER. | BURTON, JOHN WILLIAM.
MOLLOY, MARY.

FORTHCOMING MEETINGS.

SESSIONAL MEETINGS.

Eastbourne, Saturday, May 18th, at 11 a.m. Discussion on "The Main Drainage of Eastbourne," by A. E. Prescott, Borough Engineer and Surveyor. Visits to the Air Compressing Station, the Main Ejector Station, The Destructor, Electric Light Works, Corporation Motor Omnibus Station, the Sewer Outfall, and the Corporation Hospital.

London, Wednesday, May 29th, at 8 p.m. Discussion on "Suggested Amendments of the L.C.C. By-Laws as to Drainage," to be opened by Louis C. Parkes, M.D., D.P.H., M.O.H., Chelsea; J. Patten Barber, M.Inst.C.E., Borough Engineer, Islington; and Isaac Young, Chief Sanitary Inspector, Battersea. Sir Shirley F. Murphy (Vice-President) in the Chair.

Plymouth.—Friday, May 31st, at 7 p.m. Discussion on "Infantile Mortality," opened by Major R. J. Blackham, R.A.M.C.
Saturday, June 1st. Visits to the Royal Dockyard and the Plymouth Co-operative Society's Bakery.

CONFERENCE AT DUBLIN, JUNE 25TH TO 29TH, 1907.

A preliminary Programme of the Conference is given at pages 52–56.

EXAMINATIONS.

In Sanitary Science as applied to Buildings and Public Works,
Inspectors of Nuisances, and
In Hygiene in its Bearing on School Life—

Edinburgh, May 3rd and 4th. *Leeds*, June 7th and 8th.
London, May 24th and 25th. *Norwich*, June 14th and 15th.
Manchester, June 21st and 22nd.

Inspectors of Meat and Other Foods—

Edinburgh, May 10th and 11th. *London*, May 31st and June 1st.
Leeds, June 28th and 29th.

Calendar, May and June, 1907.

As far as at present arranged.

Council Meetings are held Monthly on the Second Wednesday in each Month and the Standing Committees in the preceding week.

MAY.

1 W. Inspection and Demonstration at Harrison & Barber's Knackers' Yard, Winthrop Street, Whitechapel, E., at 3 p.m. Conducted by R. Glover, F.R.C.V.S., Veterinary Inspector, County Borough of West Ham.

1 W. Lecture to Sanitary Officers at 7 p.m. "Practical Methods of Stalling and Slaughtering Animals," by W. Hunting, F.R.C.V.S.

2 Th. Diseased Meat, with a Demonstration of Morbid Specimens collected from Meat Markets, at 7 p.m., by James King, M.R.C.V.S.

3 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

3 F. / 4 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and on Hygiene in its bearing on School Life, Edinburgh.

4 S. Inspection and Demonstration at the Sewage Outfall Works, Barking, at about 3 p.m. Conducted by John Edward Worth, M.INST.C.E., District Engineer, London County Council.

4 S. Demonstration on Meat Inspection to Commissioned Officers and Professional Men at Metropolitan Cattle Market, at 3 p.m., by James King, M.R.C.V.S.

7 T. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on "Meat Inspection," by James King, M.R.C.V.S.

9 Th. Inspection and Demonstration at the Metropolitan Cattle Market at 2 p.m. Conducted by James King, M.R.C.V.S.

10 F. / 11 S. } Examination for Inspectors of Meat and other Foods, Edinburgh.

11 S. Demonstration—Meat Inspectors' Course at 2 p.m.

11 S. Demonstration on Meat Inspection to Commissioned Officers and Professional Men at Metropolitan Cattle Market, at 3 p.m., by James King, M.R.C.V.S.

13 M. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

14 T. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

15 W. **Annual Dinner,** at the Langham Hotel, when the President, His Grace the Duke of Northumberland, K.G., will take the chair.

15 W. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

15 W. Demonstration—Meat Inspectors' Course, at 6.30 p.m., on Foods, other than Meat, by Col. J. Lane Notter, R.A.M.C.

16 Th. Lecture to Commissioned Officers and Professional Men, at 5 p.m., on Milk, Butter, Cheese, etc., by Prof. H. R. Kenwood, M.B., D.P.H.

16 Th. Demonstration—Meat Inspectors' Course at 6.30 p.m., on Foods, other than Meat, by Col. J. Lane Notter, R.A.M.C.

17 F. Lecture to Commissioned Officers and Professional Men, at 5 p.m., on Tinned and Potted Food, by Prof. H. R. Kenwood, M.B., D.P.H.

17 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

18 S. Demonstration to Commissioned Officers and Professional Men, at 3 p.m., at the Metropolitan Cattle Market, by James King, M.R.C.V.S.

18. S. **Sessional Meeting,** EASTBOURNE, at 11 a.m. Discussion on "Main Drainage of Eastbourne," by A. E. Prescott. Visits to the Air Compressing Station, the Main Ejector Station, The Destructor, Electric Light Works, Corporation Motor Omnibus Station, the Sewer Outfall, and the Corporation Hospital.

23 Th. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Fish, Eggs, Tea, Coffee, Cocoa, Chocolate. Lime Juice, by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

24 F. Lecture to Commissioned Officers and Professional Men, at 5 p.m., on Wheat, Rice, Arrowroot, and other Grains, Potatoes, Flour, Bread, Biscuits, Sugars, by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

24 F. }
25 S. } Examination in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, London.

25 S. Demonstration—Meat Inspectors' Course at 2 p.m.

25 S. Demonstration on Meat Inspection to Commissioned Officers and Professional Men, at 3 p.m., at Metropolitan Cattle Market, by James King, M.R.C.V.S.

27 M. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Succulent Vegetables and Fruits, Jams; the Condiments—Vinegar, Pepper, Mustard; Prepared, Concentrated, and Preserved Foods, by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

28 T. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Alcoholic Beverages—Beer, Wines, Whisky, Brandy, etc., by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

29 W. Course of Lectures to Commissioned Officers and Professional Men—Visit to Factory for preparation of Concentrated and Preserved Foods.

29 W. **Sessional Meeting,** LONDON, at 8 p.m. Discussion on "Suggested Amendments of the L.C.C. By-Laws as to Drainage," by Louis C. Parkes, M.D., D.P.H., J. Patten Barber, M.INST.C.E., and Isaac Young.

JUNE.

May 31 F. }
June 1 S. } **Sessional Meeting,** PLYMOUTH, at 7 p.m. Discussion on "Infantile Mortality," to be opened by Major R. J. Blackham, R.A.M.C. Visits to the Royal Dockyard and the Plymouth Co-operative Society's Bakery.

31 F. }
June 1 S. } Examination for Inspectors of Meat and Other Foods, London.

7 F. }
8 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Leeds.

14 F. }
15 S. } Examinations in Sanitary Science as applied to Building and Public Works, for Inspectors of Nuisances, and in Hygiene in its Bearing on School Life, Norwich.

21 F. }
22 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its Bearing on School Life, Manchester.

25—29 **Conference at Dublin.**

28 F. }
29 S. } Examination for Inspectors of Meat and Other Foods, Leeds.

JULY.

27 S. **Visit to Exhibition at Garden City, Letchworth.**

AUGUST.

5—14 **International Congress and Exhibition on School Hygiene, London.**

MEMBERS AND ASSOCIATES ELECTED.

During April, 1907.

MEMBERS.

Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

2239 1907. Apr. Brincker, John Augustus Herman, B.A., M.B., B.C., D.P.H., F.I.C., M.R.C.S., L.R.C.P., 57, *Great Ormond Street, W.C.*

2210 1907. Apr. Clarke, Arthur Hopkins, M.R.C.S., L.R.C.P., *Government Medical Officer*, 161, *Macquarie St., Hobart.*

2211 1907. Apr. Maitland, Robert Lindley, B.A., *Chief Inspector, Main Drainage Department, Public Works Ministry, Cairo, Egypt.*

2212 1907. Apr. Mudaliar, M. Muthuvadivalu, *Civil and Military Station, Municipality, Bangalore, India.*

2213 1907. Apr. ‡Powers, Percy, *Leicester Road, Hinckley, Leicester.*

2214 1907. Apr. Raikes, H. P., ASSOC.M.INST.C.E., 63, *Temple Row, Birmingham.*

2215 1907. Apr. ‡Stewart, James, 28, *Crozier Street, Lambeth, S.E.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.
S Marked thus have passed the Examination of the Institute in Practical Hygiene for School Teachers.

4121 1907. Apr. *S* Anderton, Miss Sarah, *Seed Leigh, Bamber Bridge, near Preston.*

4119 1907. Apr. Brand, Mrs. Laura Augusta, 36, *Halford Rd., Richmond, Surrey.*

4125 1907. Apr. ‡Dibblin, Leslie Herbert, 6, *Florence Road, New Cross, S.E.*

4126 1907. Apr. ‡Dixon, Thomas P., *Regent Road, Blackpool.*

4127 1907. Apr. *S* Harris, Miss Mary Treverton, 9, *Holland Street, Blackburn.*

4120 1907. Apr. Herskind, Miss Margaret D., 19, *Lancaster Gate, Hyde Park, W.*

4128 1907. Apr. ‡Langhorn, Robert, *Old Hutton, Kendal.*

4129 1907. Apr. ‡Lynch, Ernest Rhodes, 69, *Ella Street, Newland Avenue, Hull.*

4121 1907. Apr. Moor, Miss Mary Katherine, 7, *St. John's Road, Oxford.*

4130 1907. Apr. ‡Morgan, William Thomas, *Brynseion Twywyrodyu, Merthyr Tydfil.*

4131 1907. Apr. ‡Robinson, Thomas Gordon, 159, *Richmond Street, Accrington.*

4132 1907. Apr. ‡Schofield, James Herbert, 13, *Colne Rd., Burnley.*

4133 1907. Apr. *S* Shipley, Miss Gertrude, 15, *Digbeth, Walsall.*

4134 1907. Apr. ‡Shorrock, James, 42, *New Park Street, Blackburn.*

4122 1907. Apr. Taylor, Miss Evelyn B. C., 16, *Eaton Place, S.W.*

4135 1907. Apr. ‡Weedon, Charles, *High Street, Burnham-on-Crouch, Essex.*

4123 1907. Apr. Wilkinson, Miss Annie Margaret, *The Public Health Dept., Lord Street, Derby.*

BILLS BEFORE PARLIAMENT.

The Council have considered the following Bills which are now before Parliament, and where action has been taken by them it is noted in each case:—

Public Health (Regulations as to Food). Presented by Mr. John Burns, supported by Dr. Macnamara.

A Bill to enable regulations to be made for the prevention of danger arising to the public health from the importation, preparation, storage, and distribution of articles of food.

The Council decided to petition in favour of this Bill.

Butter and Margarine. Presented by Sir Edward Strachey.

A Bill which restricts the amount of water in butter, margarine, and butter substitutes, and makes provisions for the registration and inspection of Butter and Margarine Factories.

The Council decided to petition in favour of this Bill, and to communicate with the Local Government Board, urging (1) that an amendment should be included in the Bill, providing that itinerant vendors of butter and margarine should have their addresses inscribed on their vehicles or receptacles, as is now required by Section 9 of the Sale of Food and Drugs Act, 1899, in the case of milk and cream, and (2) that power should be given to officers of local authorities to procure samples of butter or margarine from such itinerant vendors.

Public Health. Presented by Mr. J. W. Wilson, supported by Mr. Harmood-Banner, Mr. Samuel Roberts, Mr. Arthur Henderson, Mr. Staveley-Hill, and Mr. Whitley.

A Bill to enable urban authorities to adopt the benefit of many clauses, which, having been introduced into private Bills of recent years, have been accepted by Parliament, and to confer upon the Local Government Board the power to extend the Act to rural districts. The Bill contains clauses relating to streets, buildings and sewers, sanitary provisions, infectious diseases, milk supply, common lodging-houses, recreation grounds, fire brigade, slaughter-houses, etc.

The Council decided to petition in favour of this Bill.

Public Health Officers. Ordered to be brought in by Sir Walter Foster, Sir Francis Powell, Sir John Tuke, and Mr. Rainy.

A Bill to ensure that none but those properly qualified shall be appointed as medical officers of health or sanitary inspectors, and to give all such officers and inspectors security in their tenure of office.

The Council did not think it desirable to take any action.

Local Authorities' Officers. Presented by Mr. Luke White, supported by Mr. Barnard, Captain Balfour, Sir Joseph Leese, Mr. Napier, and Mr. H. W. Forster.

A Bill which extends the provisions of the Poor Law Officers' Superannuation Act, 1896, to urban district councils who may wish to adopt them; and which deals with the question of tenure of office.

The Council did not think it desirable to take any action.

Infant Life Protection. Presented by Mr. Staveley Hill, supported by Sir John Kennaway, Mr. Arthur Lee, Mr. Hay, Mr. Walrond, Mr. Ramsay Macdonald, Mr. Hills, and Mr. Nicholls.

A Bill to extend the provisions of the Infant Life Protection Act, 1897, to cases where only one child is taken in to be nursed or maintained, and to provide for more efficient inspection and supervision of such children.

The Council decided to petition in favour of this Bill.

Education Acts Amendment. Presented by Mr. Walter Rea, supported by Mr. Shackleton, Mr. Frederick Edwin Smith, Mr. Tomkinson, Mr. Williamson, Mr. Guest, Mr. Masterman, and Mr. Tennant.

A Bill to make provision for vacation schools, and for the medical inspection and treatment of school children.

The Council decided to petition in favour of this Bill.

Factory and Workshop Act (1901) Amendment. Presented by Mr. Cameron Corbett, supported by Mr. Crombie, Mr. Arthur Henderson, Mr. Ramsay Macdonald, and Mr. Trevelyan.

A Bill to distribute the working hours in laundries more regularly over the week; to regulate the daily working hours; and to bring within the scope of the Factory Act, religious and charitable institution laundries, and the smaller laundries.

The Council did not think it desirable to take any action.

Hours of Labour (Bakehouses). Presented by Mr. Wilkie, supported by Mr. Steadman, Mr. Gill, Mr. Bowerman, Mr. Bell, Mr. Barnes, Mr. James Haslam, Mr. Shackleton, and Mr. Thorne.

A Bill to restrict the hours of labour in bakehouses to forty-eight hours a week.

The Council did not think it desirable to take any action.

Home Work Regulation. Presented by Mr. Ramsay Macdonald, supported by Mr. Crooks, Mr. Fenwick, Mr. George Roberts, Mr. Ernest Lamb, Mr. Billson, Mr. Fiennes, Sir Gilbert Parker, and Mr. Mitchell Thomson.

A Bill to provide for the better regulation of home industries, by the certification of all persons to whom work is given to be done at their own homes.

The Council decided to petition against this Bill, on the following grounds: that the licensing system proposed would prove cumbersome and impossible; that under the Public Health Acts and the Factory and Workshop Act adequate machinery for the purpose of sanitation already exists, and the licences would be of no assistance in the administration of these Acts; that it is very undesirable to place autocratic power in the hands of an official, whether of the State or of a Municipality, and as the forfeiting of a licence, even for a short period only, might entail the loss of a man's livelihood—a penalty which, in every other licensed business, is imposed by a Magistrate only—the Council are of opinion that the intervention of the magistrate between the official and the public is essential not only to justice, but to make justice apparent.

Housing of the Working Classes Acts Amendment. Ordered to be brought in by Sir Walter Foster, Sir Francis Channing, Mr. Soames, Mr. Eve, Mr. Hart Davies, and Mr. Nicholls.

A Bill to facilitate the building of houses for the working classes in rural districts.

The Council did not make any resolution upon this Bill, as they understood that the Government were likely to introduce a Bill dealing with the subject.

CONFERENCE AT DUBLIN,

JUNE 25th to 29th, 1907.

TO BE HELD IN TRINITY COLLEGE,

By kind permission of the Provost and Fellows.

Patron.

HIS EXCELLENCY THE RT. HON. THE EARL OF ABERDEEN, P.C., G.C.M.G.

President.

THE RT. HON. THE EARL OF ROSSE, K.P., F.R.S., D.C.L., LL.D.

Vice-Presidents.

T. J. STAFFORD, C.B., L.R.C.P.I., L.M., F.R.C.S.I., *Medical Commissioner, Local Government Board.*

ANTHONY TRAILL, M.D., LL.D. S.F.T.C.D., *Provost of Trinity College, Dublin.*

ROBERT E. MATHESON, LL D., *Registrar-General for Ireland.*

JOSEPH REDMOND, M.D., *President, Royal College of Physicians, Ireland.*

SIR ARTHUR CHANCE, F.R.C.S.I.

HENRY R. SWANZY, M.D., F.R.C.S.I., *President of the Royal College of Surgeons, Ireland.*

J. MAGEE FINNY, M D., F.R.C.P., *President of the Royal Academy of Medicine, Ireland.*

THE RT. HON. THE LORD MAYOR OF DUBLIN.

THE RT. HON. THE LORD MAYOR OF BELFAST.

REV. THOMAS HAMILTON, M.A., D.D., LL.D., *President, Queen's College, Belfast.*

BERTRAM C. A. WINDLE, M.A., D SC., M.D. F.R.S., *President, Queen's College, Cork.*

ALEXANDER ANDERSON, M.A., LL.D., *President, Queen's College, Galway.*

P. J. O'NEILL, J.P., *Chairman, Dublin County Council.*

Hon. Secretaries.

D. EDGAR FLINN, D.P.H., F.R C.S.I., *Medical Inspector, Local Government Board, Ireland.*

W. KAYE-PARRY, M.A., M.INST.C.E., F.R I.B.A., *Offices—63, Dawson Street, Dublin.*

TUESDAY, JUNE 25th, 1907.

8 p.m.—Inaugural Meeting.

WEDNESDAY, JUNE 26th, 1907.

Sect. 1.—"Sanitary Science & Preventive Medicine."

To be held in Trinity College.

President.

SIR CHARLES A. CAMERON, C.B., M.D., F.R.C.P.I., D.P.H., PH.D.

Vice-Presidents.

C. L. BIRMINGHAM, M.D., D.P.H.

D. DONOVAN, M.D.

NINIAN M. FALKINER, M.D., F.R.C.P.,
Superintendent of Statistics, Registrar-General's Dept.

J. H. FERGUSSON, M.D., F.R.C.S.I.

C. BRENDEN McCARTHY, B.A., M.D., D.P.H.

HENRY O'NEILL, M.D., M.CH.

PROF. ANTONY ROCHE, L.R.C.P.I., L.R.C.S.I.

SUBJECTS FOR DISCUSSION—

"Poor Law and Sanitary Administration in Ireland."

Opened by SIR CHARLES A. CAMERON, C.B, M.D., F.R.C.P.I., D.P.H., Ph.D.

SPEAKERS—

S. AGNEW, M.A., M.D., *M.O.H., Lurgan.*

C. L. BIRMINGHAM, M.D., D.P.H.

E. MAGENNIS, M.D., D.P.H., J.P.

"The Role of Sanatoria as a Factor in checking Tuberculosis."

Opened by Professor E. J. McWEENEY, M.A., M.D., D.P.H.

SPEAKERS—

H. HANDFORD, M.D., D.P.H.,
Hon. Consulting Physician, Nottingham and Notts Sanatorium for Consumption.

PROF. ANTONY ROCHE, L.R.C.P.I., L.R.C.S.I.

W. G. WILLOUGHBY, M.D., D.P.H., *M.O.H., Eastbourne.*

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2 p.m. Visit to Messrs. Guinness's Brewery, and Iveagh Trust Lodging House.

THURSDAY, JUNE 27th, 1907.

Section II.—"Engineering and Architecture."

To be held in Trinity College.

President.

P. C. COWAN, B.Sc., M.Inst.C.E.

Vice-Presidents.

GEORGE CHATTERTON, M.Inst.C.E.

SIR THOMAS DREW, F.R.I.B A.,
President, Royal Hibernian Academy.

WILLIAM M. MITCHELL, F R.I.B.A., R.H.A.,
President, Royal Institute of the Architects of Ireland.

WILLIAM ROSS, B.E.,
President of the Institution of Civil Engineers in Ireland.

Subjects for Discussion—

"The Economic Housing of the Working Classes in Town and Country."

Opened by P. C. COWAN, B.SC., M.INST.C.E.

Speakers—

Sir Lambert H. Ormsby,
Senior Surgeon, Meath Hospital and Co. Dublin Infirmary; Past Pres, R.C.S.I.

Councillor W. F. Anderson, *J.P., Glasgow.*

J. Spottiswoode Cameron, M.D., B.SC.,
M.O.H., Leeds.

"Could the existing Statutory and Departmental Requirements as to Sewage Disposal be relaxed in certain cases with advantage to the Community?"

Opened by W. KAYE-PARRY, M.A., M.INST.C.E., F.R.I.B.A.

Speakers—

W. E. Adeney, D.SC., F.C.S., F.I.C.

G. Chatterton, M.INST.C.E.

W. Fairley, ASSOC.M.INST.C.E.

Prof. A. Bostock Hill, M.SC., M.D, D.P.H.

2 p.m. Their Excellencies, the Lord Lieutenant and the Countess of Aberdeen, have kindly intimated their intention of receiving the Members at a Garden Party in the afternoon, at the Vice-Regal Lodge, Phœnix Park.

(*Those wishing to attend must send in their names to the Secretary of the Institute by May 6th.*)

FRIDAY, JUNE 28th, 1907.

Section III.—"Physics, Chemistry, Biology, and Meteorology."

To be held in Trinity College.

President.

SIR JOHN WILLIAM MOORE, M.D., D.P.H., M.R.I.A., D.L., M.CH., F.R.C.P.I.

Vice-Presidents.

WALTER E. ADENEY, D.Sc., F.C.S., F.I.C.
PROF. E. A. LETTS, PH.D., F.R.S.E., F.C.S.
PROF. EDMOND J. MCWEENEY, M.A., M.D., D.P.H.
PROF. ALFRED SENIER, PH.D.

SUBJECTS FOR DISCUSSION—

"The Climatology of Ireland in relation to Public Health."
Opened by SIR WILLIAM JOHN MOORE, M.D., D.P.H., M.R.I.A., D.L., M.CH., F.R.C.P.I.

SPEAKERS—

J. R. KAYE, M.B., D.P.H., *M.O.H., West Riding of Yorks C.C.*

"Disinfection considered from a Medical, Chemical, and Bacteriological standpoint."
Opened by S. RIDEAL, D.Sc., F.I.C.

2 p.m. Visit to the New Main Drainage Works.

SATURDAY, JUNE 29th.

Excursions will be arranged to GLENDALOUGH and the SEVEN CHURCHES, Co. Wicklow.
Price of combined Rail, Cars, and Luncheon Tickets, 10s. 6d.

Saturday to Monday Excursion to KILLARNEY.
Price of combined Rail & Hotel Tickets: 1st Class, £2 1s.; 2nd Class, £1 16s.

LIST OF AUTHORITIES WHO HAVE APPOINTED DELEGATES TO THE DUBLIN CONFERENCE.

Abingdon.
Apothecaries' Hall of Ireland.
Architectural Association of Ireland.
Architectural Association.
Battersea.
Baltinglass R.D.C.
Blackpool.
Blackrock U.D.C.
Bootle.
British Medical Association.
Burslem.
Bray U.D.C.
Camberwell.
Carmarthen C.C.
Catholic University School of Medicine, Dublin.
Celbridge R.D.Cs, Nos. 1 & 2.
Clitheroe.
Congested Districts Board for Ireland.
Cumberland C.C.
Darlington.
Denbighshire C.C.
Dublin.
Dublin and Irish District of Institute of Journalists.
Dublin Sanitary Association.
Dundee.
Eastbourne.
East Sussex C.C.
Eccles.
Enniscorthy U.D.C.
Epsom R.D.C.
Fenny Stratford U.D.C.
Folkestone.
Fulham.
Gateshead.
General Prisons Board (Ireland).
Glasgow.
Glenties D.C.
Guy's Hospital.
Halifax.
Hanley.
Hebburn U.D.C.
Huddersfield.
Ilkley.
Institute of Marine Engineers.
Irish Institute of Journalists.
Junior Institution of Engineers.
Keighley.
Kesteven C.C.
Kilkenny U.D.C.
Killiney and Ballybrack U.D.C.
Kingston-on-Thames.
Kingstown U.D.C.
Lanarkshire C.C.
Lancaster.
Larne U.D.C.
Leeds.
Liverpool Engineering Society.
London (City of).
London School of Medicine for Women.
Londonderry C.C.
Londonderry.
Loughrea R.D.C.
Lurgan R.D.C.
Lurgan T.C.
Maidenhead.
Merioneth C.C.
Middlesborough.
Middleton R.D.C.
Moira R.D.C.
Montrose.
Newport (Mon.).
Newport (Salop).
New Ross U.D.C.
Northampton.
North of England Institute of Mining Engineers.
Notts C.C.
Pembroke U.D.C.
Queen's College, Galway.
Rathmines U.D.C.
Rhondda U.D.C.
Ribble Joint Committee.
Richmond Main Sewerage Board.
Richmond.
Royal Academy of Medicine in Ireland.
Royal College of Physicians, Ireland.
Royal College of Surgeons, Ireland.
Royal College of Veterinary Surgeons.
Royal Dublin Society.
Royal Institute of Architects, Ireland.
Royal University of Ireland.
Rotherham.
Salop C.C.
Scariff R.D.C.
Shoreditch.
Society of Architects.
Southend-on-Sea.
Staffordshire C.C.
St. George's Hospital Medical School.
St. John's Hospital for Diseases of Skin.
Surveyors' Institution (Irish Branch).
Tottenham U.D.C.
Trim R.D.C.
University College of Wales.
University of Birmingham.
University of Durham College of Medicine.
University of Wales.
Wakefield.
Wallsend.
War Office.
Warwickshire C.C.
Waterford.
West Bromwich.
West Riding C.C.
West Riding of Yorkshire Rivers Board.
Wigan.
Wolverhampton.
Wood Green U.D.C.

THE ROYAL SANITARY INSTITUTE.

ANNUAL REPORT OF THE COUNCIL

FOR THE YEAR 1906.

Read at the Ordinary General Meeting, April 24th, 1907.

INTRODUCTION.

The report for the year 1906 is a record of steady progress and continued activity in all the various branches of the Institute's work.

During the year public attention was drawn to the American Canned Meat Trade, and the need of proper precautions for ensuring the purity and soundness of the food thus treated was much emphasised. Articles appeared in the public Press, by which widespread interest in the subject was aroused, and they had immediate effect in turning public attention to the important question of the purity of the food supply. It is obvious that one of the means to be adopted for procuring a wholesome food supply is the establishment of a system of inspection of places where food is prepared or stored, by a staff of properly qualified and thoroughly competent officers. The steps which the Institute has taken to ensure a supply of qualified Inspectors of Meat and Foods, are well known, and are dealt with in detail in another part of this report, but it is satisfactory to note here that when the subject was discussed in the House of Commons, the Secretary of State for War (Mr. Haldane) referred to the Institute's work in this direction, and spoke of the Examination for Meat Inspectors as being a very searching test of knowledge.

Another apparent effect of the canned meat agitation was the introduction of a Government Bill into the autumn session of Parliament, giving the Local Government Board power to make

regulations with regard to the inspection of food. As will be seen in another part of the report, the Institute petitioned Parliament in favour of this Bill.

NEW PREMISES.

The Council were not able, during the past year, to lay before the Members any definite proposition with regard to new premises, but the matter has engaged the attention of the Special Committee, and their deliberations may be expected to result shortly in a satisfactory proposal for rehousing the Institute on a more adequate scale.

ASSOCIATED WORK.

The useful work which the Institute has been able to do in the way of advising on sanitary matters, has been continued through the past year. A large number of applications for assistance have been made from all parts of the United Kingdom, and inquiries have been received from abroad, and expressions of appreciation have reached the Institute from the authorities and persons who sought advice, for the assistance thus rendered in the cause of public health.

The Institute have been energetically co-operating with the large Organising Committee in the arrangements for the Second International Congress on School Hygiene and the Exhibition of School Building and Furnishing Appliances, which is to be held in London in August, 1907. It is anticipated that this meeting will be a very large and important gathering, and of a thoroughly international character.

SANITARY LEGISLATION.

The Council had under consideration the following Bills introduced into Parliament during the year. The action taken by the Council and the fate of the Bill is noted in each case:—

Public Health Acts (Amendment) Bill (Lords). Introduced by the Lord Hylton.

To exempt buildings sufficiently isolated, from the operation of certain existing and future building by-laws; to provide against

alterations of such exempted buildings; and generally to facilitate the erection of workmen's cottages in rural districts.

Decided to petition in favour of the Bill. The Bill did not pass the Commons.

Public Health Bill. Presented by Sir James Woodhouse, supported by Mr. Harmood-Banner, Mr. J. W. Wilson, Mr. S. Roberts, and Mr. Arthur Henderson.

To enable urban authorities to adopt the benefit of many clauses, which, having been introduced into Private Bills of recent years, have been accepted by Parliament, and to confer upon the Local Government Board the power to extend the Act to Rural Districts. The Bill contained sections dealing with streets, buildings and sewers, sanitary provisions, infectious diseases, milk provisions, common lodging houses, and recreation grounds.

Decided to petition in favour of the Bill, which, however, was dropped.

Housing of the Working Classes, &c., Bill. Presented by Mr. Steadman, supported by Mr. Alden, Mr. Bell, Mr. J. H. Bethell, Mr. Bowerman, Mr. Nannetti, Mr. John Johnson, Mr. Thorne, and Mr. Wiles.

Extends the period for which money may be borrowed by local authorities to 100 years, and generally deals with administrative and political questions.

Decided that no action be taken, as the Bill contained so many provisions which were outside the province of the Institute. The Bill was dropped.

Housing of the Working Classes Acts Amendment Bill. Presented by Mr. Mackarness, supported by Sir Walter Foster, Mr. Channing, Mr. Robert Price, Mr. Soames, Mr. Rowlands, Mr. E. A. Strauss, and Mr. Morrell.

To facilitate the building of houses for the working classes in rural districts.

Decided to petition in favour of the Bill, which was committed to a Select Committee of the House.

Factory and Workshop Act (1901) Amendment Bill. Presented by Mr. Cameron Corbett, supported by Mr. Crombie, Mr. Arthur Henderson, Mr. Ramsay Macdonald, and Mr. Trevelyan.

To distribute the working hours in laundries more regularly over the week; to regulate the daily working hours; and to bring within

the scope of the Factory Act the laundries in religious and charitable institutions, and the smaller laundries.

Decided to petition in favour of the Bill, which was, however, dropped.

Tuberculosis (Animals) Prevention and Compensation Bill. Presented by Mr. Field, supported by Mr. Kilbride, Mr. John Roche, Mr. Condon, Mr. W. W. Rutherford, Sir Carne Rasch, Mr. William Jones, Mr. Shackleton, Mr. Charles E. Schwann, and Mr. MacIver.

To provide for the payment of compensation to owners of carcases condemned after slaughter on account of tuberculosis.

No action was taken. The Bill was dropped.

Public Health (Regulations as to Food) Bill. Presented by Mr. John Burns, supported by Mr. Runciman.

To enable regulations to be made for the prevention of danger arising to public health from the importation, preparation, storage, or distribution of articles of food.

Decided to petition in favour of the Bill, which was withdrawn.

Meat Marking (Ireland) Bill. Presented by Mr. Field, supported by Mr. Condon, Mr. Patrick O'Brien, Captain Donelan, and Mr. O'Mara.

To provide for the marking of imported, frozen, and chilled meat in Ireland.

No action was taken. The Bill was dropped.

Diseases of Animals Act (1896) Amendment Bill. Presented by Mr. Cairns, supported by Mr. H. Greenwood, Mr. Crooks, Mr. Robert Price, Mr. J. Allen Baker, Mr. Hubert Beaumont, and Mr. Halley Stewart.

To permit the landing of Canadian cattle, without such cattle being subject to the provisions of the Diseases of Animals Act, 1894, as to slaughter or quarantine.

No action was taken, as the Bill had been dropped.

Infectious Disease (Ireland) Bill. Presented by Mr. Bryce, supported by Mr. Attorney-General for Ireland.

To provide that the Infectious Diseases (Notification) Act, 1889, shall extend to every sanitary district in Ireland, whether it has or has not been adopted by the sanitary authority.

Decided to petition in favour of the Bill, which was withdrawn.

Removal of Offensive Matter Bill. Presented by Mr. John Burns.

To extend the provision as to the hours of removal of offensive matter within the County of London to the whole of the Metropolitan Police District.

The provisions of this Bill did not appear to call for any action on the part of the Institute.

The Bill received the Royal Assent.

Vaccination Bill. Presented by Mr. Arthur Black, supported by Mr. Channing, Mr. Levy, Sir Charles M'Laren, Mr. Ramsay Macdonald, Mr. Nicholls, Mr. George White, and Sir William Collins.

To provide that no prosecution under the Vaccination Acts shall be initiated by officers of local authorities without the consent in writing of such local authority.

Decided to petition against the Bill, which, however, was dropped.

Vaccination Prosecutions Bill. Ordered to be brought in by Mr. Pickersgill, Mr. Channing, Mr. Goddard, Mr. Brigg, Mr. Corrie Grant, and Mr. Bell.

To provide that no prosecution under the Vaccination Acts shall be commenced without the authority of the Guardians.

Decided to petition against the Bill, which was dropped.

Nurses' Registration and Qualification Bill. Presented by Mr. Claude Hay, supported by Sir Arthur Bignold and Mr. Findlay.

To institute a system of registration of trained nurses, and to regulate their qualifications.

The provisions of this Bill did not appear to call for any action on the part of the Institute.

The Bill was dropped.

SESSIONAL MEETINGS.

Meetings were held in London in February, April, and December; and during the year in the following towns:—Manchester, Leicester, Bournemouth, Derby, Belfast, Brighton, and Malvern. The discussions were in most cases arranged in the morning, and demonstration visits were made in the afternoon to Sanitary works, relating, where possible, to the subjects discussed. There was an attendance at the various meetings ranging from 45 to 300.

The Royal Sanitary Institute is indebted to Prof. J. Radcliffe, M.SC.(TECH.), E. G. Mawbey, M.INST.C.E., Dr. P. W. G. Nunn, Dr. S. Barwise, Dr. W. J. Howarth, J. Munce, M.INST.C.E., Dr. A.

Newsholme, and Dr. G. H. Fosbroke, who very kindly acted as Local Secretaries and organised these successful meetings.

Hospitality was kindly extended to the Members by the Markets Committee, Manchester; the Mayor and Sanitary Committee of Bournemouth; Messrs. Nestlé & Co., Tutbury; Alderman J. King Kerr, M.D., J.P., and the Reception Committee, Belfast; The Chairman and Sanitary Committee, Brighton; Col. E. Twynam, F. Moerschell, Proprietor of the Imperial Hotel, and a Committee of Residents, Malvern.

The following subjects were brought forward:—

"Meat Inspection," by A. SHERIDAN DELÉPINE, M.B., M.SC., and "The Jointing of Pipes for Drains and Sewers," by Prof. J. RADCLIFFE, C.E.; Colonel J. Lane Notter, R.A.M.C., Chairman of Council, in the Chair.

"Is the Intercepting Trap a Failure?" by W. BUTLER, M.B., D.P.H., and R. READ, A.M.I.C.E.; O. Claude Robson, M.INST.C.E., in the Chair.

"Cremation," by C. KILLICK MILLARD, M.D., D.SC.; Colonel J. Lane Notter, R.A.M.C., Chairman of Council, in the Chair.

"The Consumptive at Home," by G. A. HERON, M.D., F.R.C.P.; A. C. Scovell, J.P., Chairman, Metropolitan Asylums Board, in the Chair.

"Sanitary Administration in a Health Resort," by PHILIP W. G. NUNN, L.R.C.P., M.R.C.S.; Colonel J. Lane Notter, R.A.M.C., Chairman of Council, in the Chair.

"The Provision of a Pure Milk Supply," by S. BARWISE, M.D., B.SC., and JOHN WHITE, F.I.C.; Colonel J. Lane Notter, R.A.M.C., Chairman of Council, in the Chair.

"The Sewage Purification Problem, with special reference to the Sewage Discharge into a Tidal Estuary," by JAMES D. WILLIAMSON, M.D., &c.; Prof. A. Bostock Hill, M.D., D.P.H., in the Chair.

"The Voluntary Notification of Phthisis in Brighton," by ARTHUR NEWSHOLME, M.D., F.R.C.P., and "Co-ordination of Measures against Tuberculosis," by G. A. HERON, M.D., D.P.H.; Colonel J. Lane Notter, Chairman of Council, in the Chair.

"The Area for Sanitary Administration," by J. W. WILLIS BUND, M.A., and "Progress in Works of Public Health in Malvern during Recent Years," by W. OSBORNE THORP, C.E.; Colonel J. Lane Notter, R.A.M.C., Chairman of Council, in the Chair.

"Advantages and Disadvantages of Heating Buildings with Gas Stoves of Various Types," by SAMUEL RIDEAL, D.SC., F.I.C.; Colonel J. Lane Notter, R.A.M.C., Chairman of Council, in the Chair.

These meetings were of distinct educational value, and also helped to extend the influence and popularity of the Institute.

A full record of the proceedings is given in the Journal, so that all the Members and Associates have opportunity of reading the papers and notes of discussions.

In connection with the meetings, visits were made to the following:—

Foreign Animals Wharf, Lairage, and Slaughter-house, Manchester.

Leicester Crematorium.

Mount Vernon Hospital for Consumption, Hampstead.

Isolation Hospital; Royal Boscombe and West Hants Hospital, Bournemouth.

Derby Sewerage Works.

Belfast Pumping Station, Sewage Outfall Works, and New Infectious Diseases Hospital at Purdysburn.

Sanatorium for Consumption, Brighton.

Malvern Sewage Farm, Destructor, and Isolation Hospital.

MEETING OF ASSOCIATES.

With a view of providing the Associates of the Institute with an opportunity of meeting together and discussing matters of sanitary interest, and of bringing before the Council any suggestions as to the work of the Institute that more especially affect the Associates as a body, the Council arranged an annual meeting of Associates. The second of these meetings was held in March, when Mr. H. D. SEARLES-WOOD, F.R.I.B.A., Member of Council, gave an address on "Buildings in Garden Cities," illustrated with lantern views. The chair was taken by Col. J. Lane Notter, R.A.M.C., Chairman of Council. There was a good attendance of Associates, and after the address the subject of the evening was discussed, and several questions relating to the work of the Institute were raised and considered. Mr. SEARLES-WOOD's address is given in Vol. XXVII, Part 5, of the Journal of the Institute.

LECTURES AND DEMONSTRATIONS ON SANITARY SCIENCE.

Two Courses of Training for Sanitary Officers were held during the year, in the Spring and the Autumn, being the 41st and 42nd Courses held by the Institute. Thirty-seven Students entered for the Spring Course; and for the Autumn Course forty-nine were

enrolled. A complete list of each course of lectures was given in the supplementary pages of the Journal.

The lectures were made as practical as possible by demonstrations in the Museum, indicating the use of the various appliances and apparatus adopted in the construction of buildings and the carrying out of sanitary work. Specimens of diseased meat and organs of animals were also used for the purposes of demonstration.

Technical Exhibitions are awarded to students by the Technical Education Board of the London County Council to the annual value of five pounds, which may, with the approval of the Board, be applied to paying the expenses of students in attending these lectures.

Inspections and Demonstrations.

The training of the students so as to insure a practical knowledge of an inspector's work and duties is a point to which the Institute attaches much importance; and, in addition to the practical demonstrations given on the various appliances in the Parkes Museum, arrangements were made for the students to visit a number of public works illustrative of sanitary practice and administration, and the students were thus given the opportunity of observing and noting the practical application of sanitary principles. In order to ensure a sound practical knowledge of the subject, a scheme is under consideration by the Council to further develop this part of the instruction.

The Institute is indebted to the London County Council, to Metropolitan Borough Councils and to District Councils, and others who are so kindly assisting them with regard to the visits, and in bringing the lectures under the notice of their officers.

Practical Training for Meat Inspectors.

In addition to the Course of general Lectures for Sanitary Officers, special Courses were arranged during the year for candidates preparing for the Examination for Inspectors of Meat and other Foods, conducted by The Royal Sanitary Institute.

Each Course consisted of two months' practical training in the inspection of meat at a Cattle Market, including demonstrations on live cattle and sheep, slaughtering and dressing of animals, names and situations of the organs, diseases of animals, methods of stalling, arrangement of markets and byres, &c.

Demonstrations were also arranged at a knacker's yard, where instruction regarding the flesh and organs of the horse was given.

At the Spring Course there were 12 Students, and at the Autumn Course 11 Students.

The Special Course of Training in Food and Meat Inspection for Commissioned Officers and Professional Men, which was established in 1904, was repeated in the Spring of 1906. Acting upon a suggestion made by the War Office, the Council widened the scope of the Course to include, as far as possible, the whole subject of food inspection, and to specially adapt it to the needs of the Officers of the Army Service Corps, who had been instructed by the Army Council to attend the Course. The Spring Course was attended by 9 students, and the Autumn Course by 7 students.

SANITARY SCIENCE AS APPLIED TO BUILDINGS AND PUBLIC WORKS.

In addition to the Courses of instruction reported above, a Course was arranged to meet the needs of candidates going up for the Examination in Sanitary Science as applied to Buildings and Public Works. The Course, which was first held in the Spring of 1906, covers the subjects set out in the Examination Syllabus, and the Council believe will supply the need for a more advanced series of lectures on Sanitary Science. Five students attended the first Course, and the second Course, held in the Autumn, was attended by 14 students.

HYGIENE IN ITS BEARING ON SCHOOL LIFE.

Another new feature of the Institute's training work during the past year, was the establishment of a short Course of Lectures on Hygiene in its bearing on School Life. This was arranged to assist teachers and others interested in the training of children and the structural conditions of the school, who purposed entering for the Examination in Hygiene in its bearing on School Life. The Course consisted of lectures and practical demonstrations relating to Personal Hygiene, and to Schools, Buildings, and Equipment. A nominal fee was charged for these Lectures, and at the Spring Course 21 students entered their names, and 28 students attended the Autumn Course.

EXAMINATIONS.

The following Examinations have been held during the year:—

IN SANITARY SCIENCE AS APPLIED TO BUILDINGS & PUBLIC WORKS.

Birmingham	Leeds	Norwich
Cardiff	Liverpool (2)	Plymouth
Edinburgh	London (2)	Sydney
Glasgow	Manchester (2)	York
Hong Kong	Newcastle-upon-Tyne	

At these Examinations 95 Candidates presented themselves, to 36 of whom Certificates were granted.

FOR INSPECTORS OF NUISANCES.

Belfast	Liverpool (2)
Birmingham	London (2)
Bloemfontein	Manchester (2)
Cape Town	Newcastle upon-Tyne
Cardiff	Norwich
Dublin	Nottingham
Edinburgh	Plymouth
Glasgow	Sydney
Hong Kong	York
Leeds	

At these Examinations 702 Candidates presented themselves, and 334 were certified competent, as regards their Sanitary knowledge, to discharge the duties of an Inspector of Nuisances under the Public Health Act, 1875.

The Sanitary Inspectors Examination Board (formed by The Sanitary Institute and other bodies), for holding Examinations under the Public Health (London) Act, 1891, held four Examinations during the year. There were 50 Certificates granted.

FOR INSPECTORS OF MEAT AND OTHER FOODS.

During the year Examinations were held in Liverpool, London (2 Examinations), Newcastle-upon-Tyne, and Sheffield. 92 Candidates presented themselves, to 54 of whom Certificates were granted.

The courses of lectures and demonstrations given at the University of Liverpool and the Municipal School of Technology, Manchester, on Food Inspection have, during the year, been added to the list of Training Courses accepted by the Committee as giving the practical training required for this Examination.

IN HYGIENE IN ITS BEARING ON SCHOOL LIFE.

Birmingham	Leeds
Blackburn	Liverpool (2)
Cardiff	London (3)
Edinburgh	Manchester (2)
Hong Kong	York

At these Examinations 103 Candidates presented themselves, to 57 of whom Certificates were granted.

The Council are pleased to report a considerable increase in the number of Candidates who have entered for the School Teachers Examination in Great Britain and Ireland. It was thought advisable to increase the centres at which this Examination could be taken, and the action of the Council has been justified by the number of Candidates who have taken advantage of this opportunity of testing their knowledge in hygiene in its bearing on school life, and also by the increased interest that has been taken in this Examination by the Educational Authorities, several of whom now include this Examination among the Certificates mentioned in the Form to be filled in by teachers in making application for appointments.

Colonial Examinations.

It is satisfactory to note the interest that has been taken by Public Health Officers in the Colonial centres of the Institute in the subject of School Hygiene. In several of the centres the local Board of Examiners have expressed a wish that the Examination in this subject should be extended to their Colony as soon as practicable. The Hong Kong Board have already held one Examination, and the Council hope that in the course of 1907 it will be found possible to arrange Examinations in other Colonies.

The Council have also had before them the question of extending the Meat Inspectors Examination to the Colonial centres, and this Examination has already been extended to Hong Kong. The first Examination will be held in that Colony in April next.

During the year examinations were held in Bloemfontein, Cape Town, Hong Kong (2), and Sydney, N.S.W.

Five Candidates presented themselves for the Examination in Sanitary Science as applied to Buildings and Public Works, and 5 Certificates were awarded.

Eleven Candidates presented themselves for the Examination in Hygiene in its bearing on School Life, and 4 Certificates were awarded.

Twenty-seven Candidates presented themselves for the Examination for Inspectors of Nuisances, and 12 Certificates were awarded.

An additional centre has been established this year, viz., in New Zealand. Dr. T. H. A. Valintine, the Assistant Chief Health Officer, kindly undertook the preliminary arrangements on his visit to England in July, and the following have expressed their willingness to serve on the Local Board of Examiners :—

SIR JOSEPH WARD, K.C.M.G., *Premier of New Zealand.*
SIR ROBERT STOUT, K.C.M.G., *Chief Justice, New Zealand.*
J. M. MASON, M.D., L.R.C.P., L.R.C.S., L.F.P.S., L.M., D.P.H., *Chief Health Officer for New Zealand.*
T. H. A. VALINTINE, M.R.C.S., L.R.C.P., D.P.H., *Assistant Chief Health Officer, Wellington, New Zealand.*
R. H. MAKGILL, M.D., D.P.H., *Government Bacteriologist, New Zealand.*
F. OGSTON, M.D., *District Health Officer, Otago, and Southland, N.Z.*
J. P. FRENGLEY, M.D., D.P.H., *District Health Officer, Auckland, N.Z.*
F. I. DE LISLE, L.R.C.P., D.P.H., J.P., *District Health Officer, Hawkes Bay, N.Z.*
A. ATKINS, F.R.I.B.A., ASSOC.M.INST.C.E., *Wanganui, New Zealand.*
F. W. MARCHANT, M.INST.C.E., *Timaru, New Zealand.*
HURST SEAGER, F.R.I.B.A., *Christchurch, New Zealand.*
THOMAS TURNBULL, F.R.I.B.A., *Wellington, New Zealand.*
H. E. FINCH, M.D.OXON., *Christchurch, New Zealand.*

Arrangements are in progress for examinations in Canada, Queensland, Western Australia, Tasmania, and South Australia, and lectures have been held preparatory to Examinations early in 1907.

The Council will be glad of the assistance of Colonial members in making the Examinations known in each of the centres, and it is gratifying to note that, owing to the extension of this branch of the work, the number of Colonial members has increased considerably.

The Council desire to express to the Members and Officers of the Colonial Examination Boards, the best thanks of the Institute for the great assistance which has been given in promoting the objects of the Institute, and their appreciation of this pioneer work in the cause of Sanitary Science.

New South Wales.

An examination was held in Sydney in December last, at the Macleay Museum, University of Sydney. Two candidates presented themselves for the Examination in Sanitary Science as applied to Buildings and Public Works, and were awarded Certificates. Nine candidates presented themselves for the Examination for Inspectors of Nuisances, to two of whom Certificates were awarded. Mr. E. M. De Burgh, M.INST.C.E., the Principal Assistant Engineer, Water Supply and Sewerage Construction, Public Works Department, Sydney, and Mr. J. M. Smail, ASSOC.M.INST.C.E., have resigned their seats on the Board of Examiners, and Mr. Thos. Griffiths, M.INST.C.E., Assistant Engineer, Metropolitan Board of Water Supply and Sewerage, Sydney, and Mr. S. T. D. Symons, M.R.C.V.S., Chief Veterinary Inspector, Department of Public Health of New South Wales, have been elected as additional members.

Dominion of Canada.

Under the scheme which was adopted by the Council in 1905 for the extension of the Board to the other provinces in the Dominion, the following have been elected as representatives of the various provinces. Arrangements are being made for an Examination in Montreal early in 1907, and it is hoped that it will also be found possible to hold Examinations in some of the other centres.

Province of Quebec:—

E. P. LACHAPELLE, M.D., *Chairman of Provincial Board of Health of Quebec, and Professor of Hygiene to the Laval University, Montreal.*

R. F. RUTTAN, M.D., C.M., *Professor of Medical Chemistry, McGill University, Montreal.*

P. E. NOBBS, M.A.EDIN., A.R.I.B.A., *Professor of Architecture, McGill University, Montreal.*

T. G. RODDICK, M.D., LL.D., *Dean, Faculty of Medicine, McGill University, Montreal.*

LOUIS LABERGE, M.D., *Medical Officer of Health, Montreal.*

J. A. BEAUDRY, M.D., *Medical Inspector, Provincial Board of Health, Montreal.*

R. S. LEA, *Consulting Engineer to the Provincial Board of Health, Montreal.*

T. A. STARKEY, M.B., D.P.H.LOND., *Professor of Hygiene, McGill University, Montreal.*

Province of Ontario:—

C. A. HODGETTS, M.D., C.M., *Secretary, Provincial Board of Health, and Registrar-General of Ontario, Toronto.*

WILLIS CHIPMAN, B.A., SC., *Consulting Sanitary Engineer, Toronto.*

CHARLES SHEARD, M.D., *Professor of Preventive Medicine, Toronto University, and Medical Officer of Health, Toronto.*

P. BRYCE, M.A., M.B., *Medical Officer to Department of Interior, Ottawa.*

F. MONTIZAMBERT, M.D., F.R.C.S.E., *Director-General of Public Health, Ottawa.*

Province of British Columbia:—

P. MOHUN, C.E., *Consulting Sanitary Engineer, Victoria.*

C. J. FAGAN, M.D., *Secretary, Provincial Board of Health, Victoria.*

Province of Manitoba:—

A. T. DOUGLAS, M.D., C.M., *Professor of Hygiene, Manitoba University, and Medical Officer of Health, Winnipeg.*

JAMES PATTERSON, M.D., C.M., *Emeritus Professor of Hygiene, Manitoba University, Winnipeg.*

Province of Nova Scotia:—

D. A. CAMPBELL, M.D., *Halifax.*

H. E. GATES, *Architect, Halifax.*

L. M. MURRAY, M.D., C.M., *Bacteriologist to Health Department, Halifax.*

Province of New Brunswick :—

E. Bayard Fisher, M.D., *Secretary, Provincial Board of Health, Fredericton.*

N. MacLaren, M.D., *St. John.*

F. Niel Brodie, *Architect, St. John.*

Province of Alberta, North-West Territories :—

J. D. Lafferty, M.D., *Registrar, College of Physicians and Surgeons, Calgary.*

British South Africa.

Two Examinations have been held in South Africa during the year. At Bloemfontein 8 Candidates presented themselves for the Examination for Inspectors of Nuisances, and 6 certificates were awarded. At Cape Town 6 Candidates presented themselves for this Examination, 3 certificates being awarded.

The Council have extended the Examination in Sanitary Science as applied to Buildings and Public Works to this Colony.

Mr. R. O. Wynne-Roberts, who has actively assisted the Board since the Examinations were established, has resigned his seat on the Board, and Mr. John Cook, M.INST.C.E., City Engineer, has been elected as an additional member.

Hong Kong and South China.

Two Examinations have been held in Hong Kong this year. In April 3 Candidates presented themselves for the Sanitary Science Examination, and 3 Certificates were awarded, and 4 Candidates for the Inspectors of Nuisances Examination, to 1 of whom a Certificate was awarded.

The first Examination in this centre—and the first in the Colonies—in Hygiene in its bearing on School Life was held in December. 11 Candidates presented themselves, and 4 Certificates were awarded.

Mr. Adam Gibson, M.R.C.V.S., who took an active part in arranging the extension of the Meat Inspectors Examination to this centre, has resigned his post as Hon. Secretary to the Board, and has been succeeded by Mr. Edwin Ralphs, M.R.SAN.I., of Queen's College, Hong Kong. The Council welcome as new members of the Board Capt. Shinkwin, A.S.C., and Mr. E. A. Irving, Inspector of Schools, Hong Kong.

South Australia.

This Board expects to hold its first Examination in May. A course of lectures has been arranged in connection with the Examination.

Western Australia.

The Council have with regret to report the death of Mr. A. Purdie, M.A., Principal of the Technical School, Perth, who was

elected a member of the Board in 1904. The following have been elected as additional members:—

T. H. LOVEGROVE, M.R.C.S., *President, Central Board of Health, Perth.*

J. B. CLELAND, M.B., C.M., *Government Bacteriologist and Pathologist, Perth.*

J. B. ALLEN, B.SC., *Lecturer at Technical College, Perth.*

A Course of Lectures has been held in this centre preparatory to an Examination which it is hoped will take place early in 1907.

Queensland.

Arrangements were made for holding the third Examination for Inspectors of Nuisances in this centre at the end of the year, and applications were received from students who wished to take the Examination. It was found necessary, however, to postpone the Examination to early in 1907.

The Commissioner for Public Health (Dr. Burnett Ham) is taking up the question of school hygiene actively in the Colony, and the possibility of arranging an Examination in this subject under the auspices of the Institute is under consideration.

Tasmania.

The first Examination for the Sanitary Inspectors Certificate will be held in May, 1907, and as great interest is being expressed in School Hygiene in the Colony it is expected that the establishment ot Examinations for the School Teachers Certificate of the Institute will follow next year.

Examinations were established by the Institute in 1877, and the following figures show the total number of Examinations held and the number of candidates:

	Examinations.	Candidates Entered.	Candidates Certified.
For Local Surveyors	35	291	142
Sanitary Science as applied to Buildings and Public Works	123	723	314
Inspectors of Nuisances	234	10,867	5,717
Inspectors of Meat and other Foods....	32	434	293
Hygiene in its bearing on School Life ..	27	184	111
	451	12,499	6,577

CONGRESS AND EXHIBITION AT BRISTOL.

The Twenty-third Congress and Exhibition of the Institute was held at Bristol from July 9th to the 14th.

Suitable accommodation was provided for the meetings of the

Congress in the Victoria Rooms, University College, and the Blind Asylum. The Exhibition was held in the Volunteer Drill Hall.

Delegates were appointed by many Sanitary Authorities and Societies.

The numbers attending the Congress were as follows:—Delegates, 422; Members and Associates of the Institute, 260; Associates of the Congress and other Subscribers, 106; Complimentary and Press, 130; making a total of 918.

The first General Meeting was held on July 9th, when the Right Hon. Sir Edward Fry, P.C., B.A., D.C.L., LL.D., F.R.S., was installed as President of the Congress, and delivered his Inaugural Address.

The business of the Congress was divided into three Sections and seven special Conferences: Section I., Sanitary Science and Preventive Medicine; Section II., Engineering and Architecture: Section III., Chemistry, Physics, and Biology. Conferences: of Municipal Representatives; of Medical Officers of Health; of Engineers and Surveyors to County and other Sanitary Authorities; of Veterinary Inspectors; of Sanitary Inspectors; of Women on Hygiene; on the Hygiene of School Life. Many subjects of special interest were brought forward and discussed—the more important papers, together with the discussions, appear in Vol. XXVII. of the Journal.

During the meeting the following Excursions were made: to Weston-super-Mare, Bradford-on-Avon, Cheddar, Wells, Blagdon, Yeo Valley Reservoir, Wye Valley, Chepstow Castle, Tintern Abbey, Caerwent, Bath, Minehead, Lynton, and Ilfracombe.

The members were most hospitably entertained at Garden Parties. by the Right Hon. Lewis Fry, P.C., the Right Hon. Sir Edward Fry, P.C., F.R.S., Mr. and Mrs. P. Napier Miles, at Clifton College by the Rev. A. H. David, and at a Conversazione and Reception by the Right Hon. The Lord Mayor.

Visits were also made to the Municipal Undertakings of the Corporation. Several of these visits were of great educational value to members, and especially to officers of Local Authorities, and to other delegates to the Congress.

The Health Exhibition was held at the Volunteer Drill Hall, Queen's Road, and was open for twelve days. It was attended by 14,343 visitors. A list of the Exhibits to which medals were awarded is given in the Supplement to the Journal, Vol. XXVII., No. 7, and also a list of certain Exhibits which required special tests in London or elsewhere before their merits could be decided upon by the judges. An Illustrated List appeared in No. 12.

LIBRARY.

Volumes and Pamphlets numbering 400 have been presented to the Library. Lists of these are published in the Supplement to the Journal.

JOURNAL.

The publication of the Journal in a monthly form has, it is believed, been found convenient to the Members, as by this means they have had the records of the proceedings of the Institute placed in their hands, in most cases within a month or six weeks of the meetings.

Efforts were made to render the reports of proceedings as concise as possible, both for the convenience of the Members, and to keep the Journal from becoming too voluminous.

The Journal is somewhat larger than the previous volume, and contains 804 pages, in addition to 224 pages of Supplemental matter.

INSTITUTE DINNER.

His Grace the Duke of Northumberland, K.G., President, took the chair at the Dinner of the Institute, held at the Langham Hotel on May 9th, at which there were 85 Members and others present.

THE HENRY SAXON SNELL PRIZE.

The subject given in 1906 for the Essay in competition for this Prize was "Suggestions for Improvements in Sanitary Appliances for use in Workmen's Dwellings and Labourers' Cottages, under the varying conditions of water supply and drainage usually obtaining in towns and villages." Nine essays were sent in and were brought under the consideration of the Council.

Acting upon the advice of the Adjudicators appointed by them, the Council decided to divide the prize between two essayists, whose essays were about equal in merit, and they awarded to Mr. John R. Preston M.R.San.I., Lancaster, writing under the motto of "John of Gaunt," and to Mr. E. H. Parkinson, Architect and Surveyor, Bradford, writing under the motto of "Spero Meliora," each the sum of Twenty-five pounds and a Bronze Medal of the Institute.

PARKES MUSEUM.

The additions to the collection of sanitary apparatus and appliances in the Parkes Museum during 1906 numbered thirty-three.

These new exhibits have been reported and described in the supplementary pages of the monthly Journal.

The position of the Museum as a public demonstration school for London in hygiene and sanitary matters, has been well maintained, and the number of classes from other institutions who visited the Museum is about the same as last year. The total number of students visiting the Museum in these organised classes was 1,535, and the number of institutions from which classes attended was 48. This number is, of course, in addition to the large attendances at the various lectures and meetings held directly under the auspices of the Institute.

The following is a list of the institutions from which classes attended, some of them sending classes on several occasions:—

Acton Central Higher Grade School.
Alexandra House Gymnasium.
Battersea Polytechnic.
Bedford College for Women.
Birkbeck Institution.
Borough Polytechnic, S.E.
Cavendish Square Convent.
Charing Cross Hospital.
Croydon Polytechnic.
Dartford Technical Institute.
East Ham Technical College.
East London Technical College.
Erith Technical Institute.
Goldsmiths' College.
Guildford Plumbing Classes.
King's College, London.
Kingston Science & Art School.
Lambeth Working Girls Daisy Club.
L.C.C. Science and Art Schools:
 Barnsbury Park.
 Blackheath Road.
 Bloomfield Road.
 Brockley Road.
 Essendine Road.
 Hackford Road.
 Lavender Hill.
 Sumner Avenue.
L.C.C. Science and Art Schools:
 The Stanley.
 Thomas Street.
 Waller Road.
 William Street.
London Hospital.
London Hospital Nurses' Home.
Middlesex County Council Teachers.
National Health Society.
National Society's Training School of Domestic Subjects.
National Training School of Cookery.
Regent Street Polytechnic.
St. Bartholomew's Hospital.
St. Bride's Physical Training College for Ladies.
Sesame House.
Skinners Company's School (Girls).
South-Western Polytechnic.
Surrey County Council Teachers.
Tottenham Polytechnic.
Tottenham Road School.
Training School of Cookery.
University College, London.
Whitelands Training College, Chelsea.

The use which has been made by the Members and Associates, of the collection of lantern slides for lecture purposes, has been greater than in previous years, 1,050 slides having been hired during the year, as against 600 in 1905.

FINANCE.

A comparison of the Annual Statements of Accounts for a period of years, shows a steady and satisfactory improvement in the financial position and stability of the Institute. Notwithstanding an increase in the general Establishment Charges, owing to the extension and development of the Institute, the regular receipts from Subscriptions and Dividends have increased at a greater rate, so that the Council have been enabled to devote nearly the whole of the income derived from the teaching and examination work of the Institute towards the improvement of its Courses of Training, and its Examinations and other work. Provision has also been made for contingencies in the way of a substantial Sinking Fund to meet the liability attaching to Life Members, for Dilapidations that may accrue under the lease of the premises, and the amount allotted to the New Premises Fund. In addition to these provisions, for the past ten years, the Council have been able to carry an amount averaging over £260 annually to the General Assets, which now exceed the Liabilities by £5,769.

The Income and Expenditure Account for the past year shews a balance in favour of the year's working of £405.

The Council have thought it desirable this year to alter the method of entering the investments in the Balance Sheet, the market value being adopted in place of the cost price. This has resulted in an apparent diminution in the balance of Assets as shewn in the account.

OBITUARY.

It is with regret that the Council have to report the death of the following:—

Hon. Fellows: Dr. Paul Brouardel, and Dr. Johann Reincke.

Fellows: Sir Joseph Ewart, and John Price.

Members: T. Gordon Bowen, J. F. Braga, J. H. Frogley, C. F. Hayward, Charles Hooper, Major-Gen. C. Phipps-Carey, Frederick Sharp, Charles Taylor, and E. T. Whitaker.

Associates: T. A. Atkinson, J. Jacka, B. Murray, W. E. Parry, W. A. Perry, T. M. Roach, R. H. Stanton, A. Watson, B. S. Williams, D. E. Williams, and F. R. Wilson.

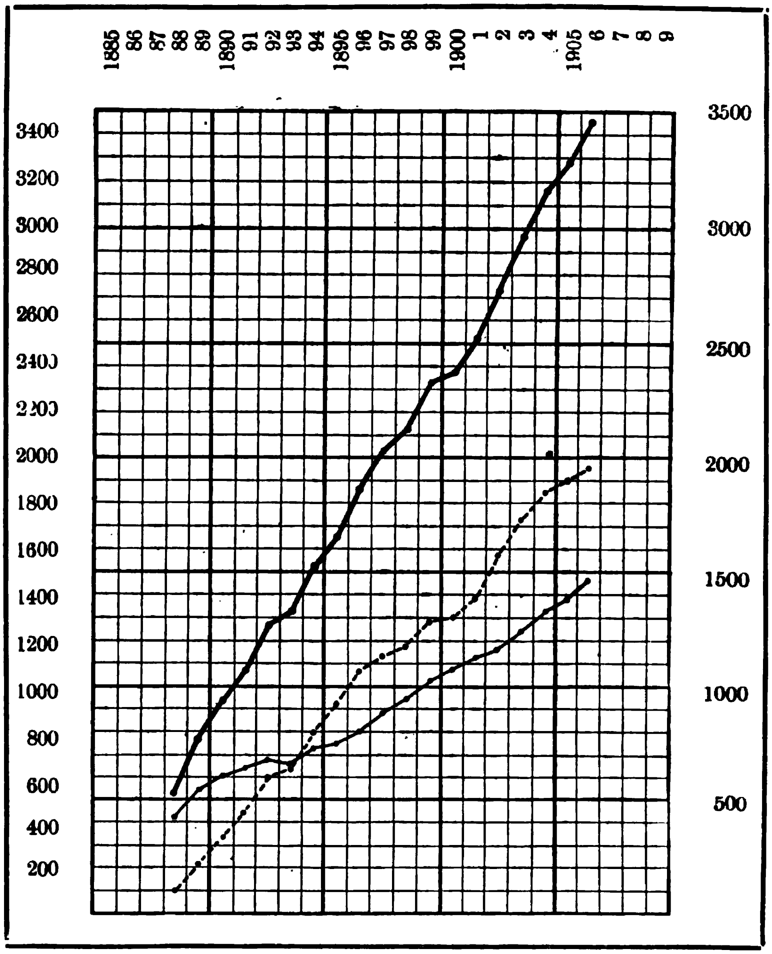
EPITOME OF REGISTERS OF MEMBERS AND ASSOCIATES.

The increase in the roll of the Institute for the year is satisfactory, 168 Members and Associates having been added to the total for the preceding year.

	Hon. Fellows.	Fellows.	Members.	Associates.	Total
Dec. 31st, 1905	42	207	1,141	1,900	3,290
Dec. 31st, 1906	40	223	1,239	1,956	3,458

Diagram showing the Yearly Increase in the Roll of the Institute.

Fell. and Mem. .—.—.—. Assoc. .---.---.---. Total



EPITOME OF THE WORK OF THE INSTITUTE, 1906.

	London Meetings and Examinations.	Total Attendance
3	Sessional Meetings for discussion of Sanitary subjects ..	260
66	Lectures, Sanitary Officers and Sanitary Science Courses	3,456
2	Special Demonstrations, Inspection of Meat	130
47	Practical Demonstrations for Sanitary Officers	2,075
2	Examinations in Sanitary Science as Applied to Buildings and Public Works	51
2	Examinations for Inspectors of Nuisances	198
2	Examinations for Inspectors of Meat	64
3	Examinations in Hygiene in its bearing on School Life	32
181	Council and Committee Meetings	987
	Ordinary General Meeting & Associates' Annual Meeting	40
98	Classes brought to the Museum	1,535
	Other persons visiting the Museum (*Estimated*)	8,000
18	Lectures on School Hygiene	333
2	Courses of Practical Instruction for Meat Inspectors lasting two months each (*Estimated*) ..	500
2	Special Courses on Meat and Food Inspection (*Estimated*)	300

	Congress and Exhibition at Bristol.	
7	Sectional Meetings	330
7	Conferences	700
3	Addresses and Lectures	1,230
	Exhibition, open for 12 days	14,343

	Provincial and Colonial Meetings.	
7	Sessional Meetings	650
15	Examinations in Sanitary Science as Applied to Buildings and Public Works	44
20	Examinations for Inspectors of Nuisances	504
3	Examinations for Inspectors of Meat and other Foods ..	28
11	Examinations in Hygiene in its bearing on School Life	71

J. LANE NOTTER,
Chairman of Council.

E. WHITE WALLIS.
Secretary.

April 10th, 1907.

STATEMENT of INCOME and EXPENDITURE

Dr. EXPENDITURE.	£	s.	d.	£	s.	d.
Establishment Charges:—						
To Rent, Rates, Taxes, and Insurance	507	0	8			
„ Salaries and Wages	1,640	6	9			
„ Coals, Lighting, and Care of Offices	105	13	11			
„ Repairs and Alterations	11	10	0			
„ Arrangement of Museum	21	13	1			
„ Library, Binding, &c.	4	7	0			
„ Postage, Telegrams, Telephone & Carriage	445	6	11			
„ Printing and Stationery	308	4	2			
„ Advertising	5	3	9			
„ Incidental Expenses	104	1	6			
„ Office Furniture	16	5	8			
„ Transferred to Sinking Fund for Contingencies	50	0	0			
				3,219	13	5
Special Expenses, exclusive of Establishment Charges:—						
To Journal and Publications, Cost of Printing, etc., less Sales and Advertisements	556	13	9			
„ Sessional Meetings	88	6	3			
„ Lectures, Sanitary Officers	265	4	10			
„ „ School Hygiene	53	2	3			
„ „ Meat Inspectors	98	0	1			
„ Examination Expenses	1,616	9	3			
„ „ „ Colonial	189	17	0			
„ Congress at Bristol	431	7	8			
„ Exhibition at Bristol	1,078	7	10			
„ List of Awards to Exhibits	7	12	6			
„ Experiments	21	12	5			
„ Institute Dinner—Balance of Expenses	11	13	7			
				4,418	7	5
„ Balance carried down				405	7	5
				£8,043	8	3

ACCUMULATED

	£	s.	d.
To Expenses on account of New Premises Fund	33	3	9
„ Depreciation of Investments (See Genl. Bal. Sheet)	1,417	10	8
„ Balance to be carried forward to next account	5,769	16	6
	£7,220	10	11

for the Year ending 31st December, 1906.

INCOME.	£	s.	d.	£	s.	d.
General Receipts:—						Cr.
By Annual Subscriptions, less Arrears written off	2,560	1	6			
„ Interest on Investments, etc.	476	17	5			
				3,036	18	11
Special Receipts:—						
„ Lectures, Sanitary Officers	293	5	9			
„ „ School Hygiene	14	18	6			
„ „ Meat Inspectors	139	13	0			
„ Examinations	2,540	3	3			
„ „ Colonial	92	4	6			
„ Congress at Bristol	356	12	3			
„ Exhibition at Bristol	1,569	12	1			
				5,006	9	4
				8,043	8	3

BALANCE.

	£	s.	d.
By Balance brought forward from last account, 1905	6,815	3	6
„ „ for the year brought down	405	7	5
	£7,220	10	11

NEW PREMISES

	£	s.	d.
To Balance carried forward to next Account	10,338	19	0
	£10,338	19	0

SAXON SNELL

	£	s.	d.	£	s.	d.
To Prizes and Expenses				52	5	11
„ Balance carried forward to next Account:—						
Funded Capital	700	0	0			
Balance available for Prizes and Expenses	32	8	8			
				732	8	8
				£784	14	7

GENERAL BALANCE SHEET,

Liabilities.	£	s.	d.	£	s.	d.
To Fees and Subscriptions paid in advance for 1907	195	14	7			
„ Sundry Creditors	1,033	19	1			
				1,229	13	8
„ Library Catalogue Account, Balance at Credit thereof	98	2	9			
„ Life Composition Fund, Balance at Credit thereof	621	8	5			
„ New Premises Fund, Balance at Credit thereof	10,338	19	0			
„ Sinking Fund, Balance at Credit thereof	90	0	0			
„ Saxon Snell Prize Fund, Balance at Credit thereof	732	8	8			
				11,880	18	10
„ Balance of Assets over Liabilities				5,769	16	6
				£18,880	9	0

Examined with the Books, Vouchers, and Accounts,
and found correct,

16th April 1907.

FUND.

	£	s.	d.
By Balance brought forward from last Account	10,167	11	6
„ Donations	171	7	6
	£10,338	19	0

Further donations have been promised to the amount of £1,009 13s. 6d.

PRIZE FUND.

	£	s.	d.
By Balance brought forward from last Account	762	18	9
„ Interest	21	15	10
	£784	14	7

31st DECEMBER, 1906.

Assets.	£	s.	d.	£	s.	d.
By Library and Contents of Museum, Furniture and Publications	1,605	5	10			
„ Subscriptions in Arrear	260	8	0			
„ Sundry Debtors	775	9	6			
„ Cash in hand and on Deposit	431	18	10			
				3,073	2	2
„ Investments—						
£7,908 11 1 2½% Consols.	7,672	16	0			
£1,000 0 0 3 % India Stock	1,095	1	0			
£1,000 0 0 3½% „	1,156	6	0			
£5,500 0 0 4 % New Zealand Stock	6,098	4	6			
£500 0 0 3½% New South Wales Stock	502	10	0			
£725 7 9 3% Metropolitan Water Board Stock	700	0	0			
Cost	17,224	17	6			
Market Value of these Securities on Dec. 31st, 1906				15,807	6	10
				£18,880	9	0

Wood, Drew & Co., Chartered Accountants, W. Collingridge, M.D. } *Auditors*

Thomas W. Cutler, *Treasurer.*

ARTICLES RELATING TO PUBLIC HEALTH,*

Appearing in the chief British and Foreign Journals and Transactions.

Abstracts of Titles classified in this List under the following headings:—

Science in Relation to Hygiene and Preventive Medicine.
Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.
Building Materials, Construction, and Machinery.
Water Supply, Sewerage, and Refuse Disposal.
Heating, Lighting, and Ventilating.
Personal and Domestic Hygiene.

The articles referred to in this list are as far as possible collected and filed in the Library of the Institute for the use of the Members and Associates.

Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.

MARSLAND, ELLIS, Hon. Sec., Society of Architects. The Effect of Fire upon Building Materials and Forms of Construction. *Building News*, March 22nd, 1907, p. 410.

The Conflagration of San Francisco—lessons to architects—protection of openings—columns and structural members—floor construction—partitions that do not expand.

Building Materials, Construction, and Machinery.

"ENGINEERING RECORD." Effect of Clay in Sand for Concrete. April 20th 1907, p. 504.

Abstract of correspondence on effect produced.

Water Supply, Sewerage, and Refuse Disposal.

"ENGINEERING RECORD." A Decision on the Cameron Patent for Process of and Apparatus for treating Sewage. 30th March, 1907, p. 403.

The decision in detail of Judge Ray, of the U.S. Court for the Northern District of New York, in the suit in equity brought by the Cameron Septic Tank Co. against the Saratoga authorities.

——— The Effect of Stripping Reservoir Sites on the Quality of Water. 5th January, 1907, p. 24.

Description of the various deleterious effects of leaving the surface soil at the bottom of an impounding reservoir, and the advantages derived from its removal.

——— Experience with Intermittent Filtration of Sewage at Worcester, Mass. 13th October, 1906, p. 416.

Historical description of the sewage filters and their action.

* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

"ENGINEERING RECORD." Fluoresceïn in the study of Underground Waters. 29th Dec., 1906, p. 730.

Describing the use of fluoresceïn in tracing the sources of an underground water supply. Fluoresceïn is a coal-tar product, red in the presence of alkalies by transmitted light and bright green by reflected light, and a dilution of 1 part in 40 million is visible to the naked eye.

GEOLOGICAL SURVEY. Summary of Progress for 1905. 1906.

Water supply of Filey, with two analyses (p. 196).

GOODRICH, FRANCIS W. Refuse Disposal in 1906. *Surveyor*, 24th Aug., 1906, p. 236.

Works of the past two years—cost of repair and maintenance—destructors at Watford, Preston, Westmount (Montreal, Canada)—refuse disposal in Dublin.

LATHAM, BALDWIN, M.Inst.C.E. Underground Water Supplies from a Sanitary Point of View. *Surveyor*, March 22nd, 1907, pp. 382-83.

Origin and quantity—sources of impurity—effects of pumping—typhoid and the water-line.

LATHAM, GEO. B., Assoc.M.Inst.C.E. Provision for Storm Water in Sewage Works. *Surveyor*, July 13th, 1906, p. 46.

Expense of the separate system of sewers—provision for storm water—rainfall—storm overflows.

PHELPS, WILLIAM. Water Supply in a Dairy District. *Surveyor*, 20th July, 1906, p. 86.

Supplies by meter—population not a sufficient basis for quantity required—charges for water—general administration.

POCOCK, T. J., and others. Memoirs of the Geological Survey. The Geology of the Country around Macclesfield, Congleton, Crewe, and Middlewich. 1906.

Water supply (p. 118)—notes of wells (pp. 22, 60, 67, 100).

REID, DR. G. Nitrification of Sewage. *Proc. Roy. Soc.*, Ser. B., Vol. 79, No. B528 (1907), p. 58.

Observations on depth of filters and grade of particles, at Hanley, Staffs, with plant dealing with 500,000 gallons a day—5 pages of tables of analyses given—by using fine particles the depth of the filter may be much reduced, and half the cost of construction saved—extra filtering capacity should be got by increasing the area rather than the depth of bed.

SHENTON, H. C. H. Small Water Supplies. *Surveyor*, Jan. 4th, 1907, pp. 4, 5; Jan. 11th, 1907, pp. 28, 29.

General design of works—collection of water—storage reservoirs—service reservoirs—ferro concrete reservoirs—water mains—conclusion.

TAYLOR, WM. GAVIN. Experiments in Distribution of Sewage over Sprinkling Filters at Waterbury, Conn., U.S.A. *Engineering Record*, 5th Jan., 1907, p. 10.

Illustrated description of conical sprinkling nozzles and rotary distributors.

USSHER, W. A. E. Memoirs of the Geological Survey. The Geology of the Country between Wellington and Chard. 1906.

Pages 58 to 61 deal with water supply.

WATSON, JOHN D., M.Inst.C.E. Sludge Treatment in relation to Sewage Disposal. *Surveyor*, 6th July, 1906, p. 6.

The arrestation of solids—tank flow and tankage—the sludge nuisance—experiments in sludge deodorization—septic tank residuum—tank treatment experiments—altering tanks.

WHIPPLE, PROF. GEO. C., C.E. The Water Supply of New York City. *Surveyor*, 17th Aug., 1906, p. 213.

Investigations of commission on additional water supply—the three systems of supply in New York—summary of reports on the subject—sources of supply—aqueducts and reservoirs—supplementary report.

Heating, Lighting, and Ventilating.

HUDSON, A. A., Barrister-at-Law. The Ventilation of London. *Building News*, Feb. 15th, 1907, p. 233.

Importance of street ventilation—house air drawn therefrom—street washing—method of paving—ventilation of areas, etc.

MEETINGS HELD.

INSTITUTE DINNER.

The Institute Dinner was held at the Langham Hotel on Wednesday, May 15th, 1907, His Grace the Duke of Northumberland, K.G., President of the Institute, in the Chair. Eighty members and guests were present, among whom were:—Major-General the Right Hon. Lord Cheylesmore; Sir Francis Sharp Powell, Bart., M.P., Vice-President; Major-General Sir Thomas Fraser, K.C.B., C.M.G.; Sir Alexander R. Binnie, M.Inst. C.E., Vice-President; Sir Thomas Brooke-Hitching (Worshipful Mayor of St. Marylebone); Sir Lauder Brunton, M.D., D.Sc., LL.D., F.R.S., President, Second International Congress on School Hygiene; Sir James Crichton-Browne, J.P., M.D., LL.D., F.R.S.; Sir John MacFadyean, M.B., B.Sc., Principal, Royal Veterinary College; Sir Aston Webb, R.A., F.R.I.B.A., Vice-President; Surg.-Gen. Sir Alfred Keogh, K.C.B., Director-General, Army Medical Service; Col. Sir Charles M. Watson, K.C.M.G, C.B., C.M.G.; Surg.-Gen. A. M. Branfoot, M.B., F.R.C.S.,

C.I.E.; The Worshipful the Mayor of Brighton (Councillor Henry Gervis, M.A., M.B.); The Chairman, Public Health Committee, London County Council (E. B. Forman, M.D., M.R.C.P., M.R.C.S.); Chairman, Sanitary Committee, City of London (S. Pollitzer); Chairman, The Sanitary Inspectors' Association (G. H. Anderson); The Rev. Canon W. Barker, M.A., Rector of St. Marylebone; Colonel G. K. Scott-Moncrieff, C.I.E., R.E., Assoc.Inst.C.E.; H. D. Searles-Wood, F.R.I.B.A., Chairman; Col. J. Lane Notter, R.A.M.C., Deputy-Chairman; and the Council of the Institute.

The President proposed the toast of "The King, Queen Alexandra, Prince and Princess of Wales, and other members of the Royal Family."

Sir John MacFadyean proposed the toast of the "Navy, Army, and Auxiliary Forces," which was responded to by Major-General Sir Thomas Fraser, K.C.B., C.M.G.

Sir Thomas Brooke-Hitching proposed the Toast of "The Houses of Parliament," which was responded to by Major-General the Rt. Hon. Lord Cheylesmore and Sir Francis Sharp Powell, Bart., who said: The two branches of the Legislature had a great deal to do with public health. The housing of the people was an old story, which with each generation brought problems of its own. He pointed out that our conceptions of sanitation now extended not only to the actual condition of the people, but also to the buildings and the districts in which those buildings were situated. Great care and attention were now bestowed on new districts, and he looked to the elevation of the people, and general improvement in taste and culture to raise the status of our vast populations. Having referred to some of the sanitary measures awaiting the consideration of the House of Commons, Sir Francis reminded the members of the Institute that the improvement in the knowledge and habits of the people generally, of which there were many interesting evidences, was largely due to the educational work and operations of The Royal Sanitary Institute. They could therefore look back with satisfaction on the past and encouragement for the future.

The President, in proposing the Toast of the evening, "The Royal Sanitary Institute," said that the institution was becoming more prosperous every year. They had to congratulate themselves on the fact that its work was not only useful, but was recognised by the public at large to be useful. As an instance of this he would remind them that the Secretary of State for War, Mr. Haldane, in a recent speech in Parliament, mentioned the value of the examinations of the Institute, and complimented it upon the admirable way those examinations were conducted. They had a great encouragement in the spread of their Colonial examinations, and the response which their efforts in that direction had met with was highly gratifying. Having referred to the regretted absence of the Hon. Sir William Lyne, K.C.M.G., the Australian Minister of Trades and Customs, the President said that the Colony of Australia was the first to welcome the Institute's Colonial examinations. It was a revelation to him that there was so much sanitary legislation before Parliament, as had

been described by Sir Francis Powell, and he wondered how many of those measures would eventually be passed into law. At any rate, they would all watch the progress of sanitary legislation in the House of Commons with interest. Having referred to the fact that the "Snell" Prize had to divided because the two successful competitors tied with an equal number of marks, His Grace said the Institute might congratulate itself upon the success of its educational efforts. The subject set before the candidates was "Suggestions for Improvements in Sanitary Appliances for use in Workmen's Dwellings and Labourers' Cottages, under varying conditions of Water Supply and Drainage." That was a subject of extreme importance just now, when there were so many proposals for bringing people back to the land by increasing the number of small holdings. One of the many difficulties in this connection was to furnish at reasonable prices the dwellings in which these small holders and small land proprietors are to live. It was a problem which he thought had not yet been solved, and would require a great deal more attention, in order that there should, in the anxiety to increase this form of property, be no sacrifice of sanitation. He congratulated the Institute on the success which had accompanied the work for which it was intended, and concluded by paying a tribute to Col. J. Lane Notter, the ex-Chairman of the Council.

MR. H. D. SEARLES-WOOD, F.R.I.B.A., the Chairman of the Council, acknowledged the toast, and mentioned that the assets of the Institute exceeded its liabilities by £5,700, in addition to £10,000 allotted to the Building Fund. They had some 800 candidates a year, and complaint was sometimes made that they were overstocking the market. But it was to be remembered that all those condidates did not present themselves for public appointments, and that having passed the course of training provided by the Institute, became centres for the spread of sanitary knowledge, and the upholders of the elementary principles of hygiene. The Institute was prospering, and he believed would continue to prosper. In concluding, Mr. Searles-Wood referred to the forthcoming Conference at Dublin.

SIR ASTON WEBB, R.A., proposed the toast of the "Visitors," which was responded to by Col. SIR CHARLES WATSON, K.C.M.G., C.B.

SESSIONAL MEETINGS.

Eastbourne, May 18th. The meeting was held in the Town Hall, when a Discussion on "The Main Drainage of Eastbourne," was opened by A. E. Prescott, Borough Engineer and Surveyor. The chair was taken by H. D. Searles-Wood, F.R.I.B.A., Chairman of the Council of the Institute.

The members were welcomed by the Mayor, Alderman Keay, J.P., who kindly provided conveyances to take the members to visit the Air-compressing Machinery, the main Ejector Station, the Destructor, Electric

Light Works, Corporation Motor Omnibus Station, Sewer Outfall, and the Corporation Hospital, where the members were entertained at tea by the Chairman and members of the Sanitary Committee.

London, May 29th. The Meeting was held in the Parkes Museum at 8 p.m., when a Discussion on "Suggested Amendments of the London County Council's By-Laws as to Drainage" was opened by Louis C. Parkes, M.D., D.P.H., M.O.H., Chelsea, J. Patten Barber, M.Inst.C.E., Borough Engineer, Islington, and Isaac Young, Chief Sanitary Inspector, Battersea. The chair was taken by Sir Shirley F. Murphy, Vice-President of the Institute.

Extraordinary General Meetings were held on Thursday, May 9th, and Monday, May 13th, when the following resolution was passed and confirmed:—

> That Article 9 of the Articles of Association of the Institute be, and the same is hereby altered, as follows:—
>
> 9. The election of Fellows shall rest with the Council, and the Council may, if they think fit, notwithstanding anything in the preceding Article contained, elect, from time to time, from among the Ordinary Members of the Institute, additional Fellows, not exceeding four in number in any one year, of whose eminence and fitness for Fellowship they are satisfied, at any period of the membership of such Ordinary Members.

Examinations.

The following Examinations have been held:—

Sanitary Science as applied to Buildings and Public Works.

April 26th and 27th, Liverpool. 5 candidates; 2 certificates granted.
May 3rd and 4th, Edinburgh. 4 candidates; 1 certificate granted.
May 24th and 25th, London. 33 candidates; 10 certificates granted.

Inspectors of Nuisances.

April 26th and 27th, Liverpool. 37 candidates; 14 certificates granted.
May 3rd and 4th, Edinburgh. 22 candidates; 12 certificates granted.
May 24th and 25th, London. 102 candidates; 51 certificates granted.

Hygiene in its bearing on School Life.

April 26th and 27th, Liverpool. 1 candidate; 1 certificate granted.
May 3rd and 4th, Edinburgh. 12 candidates; 7 certificates granted.
May 24th and 25th, London. 9 candidates; 6 certificates granted.

Inspectors of Meat and Other Foods.

May 10th and 11th, Edinburgh. 6 candidates; 4 certificates granted.

Candidates who have received Certificates.

Sanitary Science as applied to Buildings and Public Works.

Bending, Frank Bausor
Cargill, William MacGilivray.
Crossley, Horace Basil.
Crump, William George.
Davies, George.
Foster, William Frederick.
Jenkins, John James.
Kennedy, James.
Marchant, Frederick Thomas.
Pearce, Walter Ernest.
Rees, Alfred Edward.
Sharpless, Arthur.
Thomas, Ernest.

Inspectors of Nuisances.

Anderson, Peter.
Baillie, Peter.
Barker, Ethel Gomme.
Barlow, Archibald Hughes.
Barnes, Robert.
Beddow, James.
Bell, Leonard.
Bew, Charles Alfred William.
Birch, Sarah Alice.
Bowker, Thomas Enoch.
Brameld, Godfrey Neville.
Brazier, Frederick Price.
Britter, Amyas.
Brookes, Ernest W.
Burden, Frederick George Sydney.
Chapman, Edith Mary.
Clark, Harold Stanley.
Cooper, George James.
Corden, Charles Frederick.
Cullis, Frederick Edward.
Davies, Frank.
Earp, Edwin Harry.
Frost, William, Junr.
Fulcher, Peter.
Gardner, William Temple.
Gibson, David.
Gibson, Leonard.
Grant. Jessie I.
Greenwood, William Edward.
Groves, Walter Edwin.
Hacking, Thomas.
Hale, Sidney Arthur Robert.
Harding, Orlo Susannah.
Harper, Frank Bartholomew.
Humphreys, Herbert George.
Hutton. E. Harry.
Ireland, Wilfred.
Johnson, Alfred Barr.
Knowles, Ernest Thomas.
Lawrence, William.
Lee, Elizabeth.
Levy, Helen.
Lloyd, Stanley Clement.
Loach, Archibald Ernest.
Macmillan, Robert Spiers.
McGibbon, James.
Merriles, Andrew Guthrie.
Minhinnick, John Thomas.
Moor, Mary Katherine.
Muirhead, Samuel Francis.
Osmond, Harold.
Peter, Henry Thomas.
Phelps, George.
Philp, Daniel Thomas.
Piggins, Carr.
Randall, Elise Orange.
Read, Ernest.
Senior, Edward Hartley.
Shadbolt, Elsie Marion.
Sharp, Amy Louisa.

Short, William James.
Simkin, Frederick.
Smith, Harry Alfred.
Smith, Herbert.
Smith, Kate.
Stevenson, Olive.
Thomas, Arthur.
Thomas, William Henry.
Thorpe, May Agatha.
Tolmie, Mary Lillias.
Triggs, George Henry.
Webster, James.
Wellstead, Alfred.
Whitworth, Clifford.
Whyte, Anne Campbell.
Williams, William Henry.
Wood, Walter William.

Inspectors of Meat and other Foods.

Cameron, Alexander.
Hamilton, Daniel, M.R.C.V.S.
Munro, James.
Young, William Jackson, M.R.C.V.S.

Hygiene in its Bearing on School Life.

Anderson, Margaret Horne.
Barnett, John.
Bigland, Elsie.
Drieselman, Muriel Dorothy.
Fenwick, Agnes Jane.
Hodge, Jane Duncanson.
Howard, Nellie.
Johnson, Ethel Gertrude Monica.
Mackerchar, Mary.
Merrett, Lucy Mary.
Ogston, Constance Irene.
Riddell, Ida Cockburn.
Roberts, Muriel May Adair.
Tanner, Bertram.

FORTHCOMING MEETINGS.

Conference at Dublin, June 25th to 29th, 1907.

A preliminary Programme of the Conference was given at pages 52–56 of the Supplement to the May Journal, Part IV.

Examinations.

In Sanitary Science as applied to Buildings and Public Works,
Inspectors of Nuisances, and
In Hygiene in its Bearing on School Life—

Leeds, June 7th and 8th. *Manchester*, June 21st and 22nd.
Norwich, June 14th and 15th. *Birmingham*, July 5th and 6th.
Cardiff, July 12th and 13th.

Inspectors of Meat and Other Foods—

Leeds, June 28th and 29th.

Calendar, June and July, 1907.

As far as at present arranged.

Council Meetings are held Monthly on the Second Wednesday in each Month and the Standing Committees in the preceding week.

JUNE.

May 31 F. June 1 S.	**Sessional Meeting**, Plymouth, at 7 p.m. Discussion on "Infantile Mortality," to be opened by Major R. J. Blackham, R.A.M.C. Visits to the Royal Dockyard and the Plymouth Co-operative Society's Bakery. Examination for Inspectors of Meat and Other Foods, London.
7 F. 8 S.	Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Leeds.
14 F. 15 S.	Examinations in Sanitary Science as applied to Building and Public Works, for Inspectors of Nuisances, and in Hygiene in its Bearing on School Life, Norwich.
21 F. 22 S.	Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its Bearing on School Life, Manchester.
25—29	**Conference at Dublin.**
28 F. 29 S.	Examination for Inspectors of Meat and Other Foods, Leeds.

JULY.

5 F. 6 S.	Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Birmingham.
12 F. 13 S.	Examination in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Cardiff.
27 S.	**Visit to Exhibition at Garden City, Letchworth.**

AUGUST.

5—14	**International Congress and Exhibition on School Hygiene, London.**

LIST OF MEMBERS AND ASSOCIATES ELECTED,

MAY, 1907.

MEMBERS.

M Marked thus have passed the Examination for Inspectors of Meat and Other Foods.
* Marked thus have passed the Examination in Sanitary Science as applied to Buildings and Public Works.
‡ Marked thus have passed the Examination for Inspectors of Nuisances

2246 1907. May. COUTTS, Francis James Henderson, M.D., M.B., CH.B., D.P.H., F.C.S. (*M.O.H.*). 264, *Hornby Rd.*, *Blackpool.*
2247 1907. May. HICKS, William Rooke, P.A.S.I., *Deputy Surveyor, Town Hall, Ealing, W.*
2248 1907. May. INNESS, William Deacon, F.R.C.P., M.R.C.S., *Medical Officer, Colonial Government, Lokoja, Northern Nigeria.*
2250 1907. May. M LEVIE, Alexander, F.R.C.V.S., 5, *Broad Street, Nottingham.*
2251 1907. May. ‡*MUGFORD, John Sidney, *Berthlwydd, Hirwain, Breconshire.*
2252 1907. May. M STABLEFORTH, William Parkinson, M.R.C.V.S., *The Laurels, Colyton, Devonshire.*
2253 1907. May. M WHITEHEAD, Joseph Donaldson, M.R.C.V.S., 40, *Tatton Road, Sale.*
2249 1907. May. YOUNG, Charles Wheeler Forrest, M.D., D.P.H., (*M.O.H.*), *Middlesex Guildhall, Westminster, S.W.*

ASSOCIATES.

4138 1907. May. ‡BARRETT, Hartley, 1, *Rhoda Street, Nelson.*
4139 1907. May. BUNNELL, F. B., 10, *Museum Street, W.C.*
4140 1907. May. ‡BURTON, John William, 4, *Clarges Street, Bulwell, Nottingham.*
4141 1907. May. ‡CHILTON, Albert Frederick Hanmer, *Madeley Wood, Iron Bridge.*
4142 1907. May. ‡GEE, George Edward, 15, *Brighton Terrace Road, Sheffield.*
4143 1907. May. ‡HANSON, Frederick, 13, *Midland Terrace, Bradford.*
4144 1907. May. ‡MOLLOY, Miss Mary, 67, *Great Brunswick Street, Dublin.*
4136 1907. May. RAWLINGS, John Jackson, 97, *Halesworth Road, Lewisham, S.E.*
4145 1907. May. ‡SAGAR, Joseph, 70, *Marlborough Terrace, Featherstone, York.*
4146 1907. May. ‡SHAW, George F., *Crofton, Croft House Lane, Huddersfield.*
4137 1907. May. TYER, P. Vennatarama, *Sanitary Inspector, Arasikere, Hassan District, Mysore Province.*
4148 1901. Nov. ‡WEST, William, 66, *Sheepfold St., Great Grimsby.*
4147 1907. May. ‡WILDRIDGE, Charles Robert, *The Sanatorium, Hedon Road, Hull.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY*

DURING MARCH AND APRIL, 1907.

*** *For publications of Societies and Institutions, etc., see under "Academies."*

ACADEMY (AMERICAN).

Philadelphia. Transactions of the College of Physicians, 1906. 322 pp., 8vo. Philadelphia, 1906. *The College.*

ACADEMIES (BRITISH).

London. Transactions of the Surveyors' Institution, Vol. XXXIX., Part IX. 36 pp., 8vo. London, 1907. *The Institution.*

——— Report of the Homes for Inebriates Association, together with the Annual Report of the Dalrymple House at Rickmansworth, 1906–1907. 20 pp., 8vo. London, 1907. *The Association.*

——— Report of the British Association for the Advancement of Science, York, 1906. 920 pp., 8vo. London, 1907. *The Association.*

——— Proceedings of the Incorporated Association of Municipal and County Engineers, 1904–05 and 1905–06. 451 pp., 8vo., London and New York. 1905. 470 pp., 8vo., London and New York, 1906. *The Association.*

——— Minutes of Proceedings of the Institution of Civil Engineers, 1906–7, Part I. 509 pp., 8vo. London, 1907. *The Institution.*

Berne. Annuaire statistique de la Suisse. 1906. 360 pp., 8vo. Berne, 1907.

——— Résultats du Recesnement Fédéral du 1er Décembre, 1900. Troisième Volume. La Population d'après les Professions. 460 pp., 4to. Berne. 1907. *Bureau de Statistique.*

Board of Agriculture and Fisheries. Agricultural Statistics, 1906. Vol. XLI., Part II. Returns of Produce Crops in Great Britain, with summaries for the United Kingdom. 168 pp., 8vo. London, 1907. *The Board.*

Burgerstein, *Dr. Leo.* Schulhygiene. 138 pp., 8vo. Leipzig, 1906. *The Author.*

Chlorine, the disinfectant value of. Reprint from *Public Health Engineer.* 55 pp., 8vo. London, 1907. *The Editor.*

Japan. Annual Report of the Health of the Imperial Navy for the year 1904. 181 pp., 8vo. Tokio, 1907. *Bureau of Medical Affairs.*

Local Government Board. Dr. Reginald Farrer's report on the lodging and accommodation of hop-pickers and pickers of fruit and vegetables. 35 pp., fcp. London, 1907.

——— Dr. R. Deane Sweeting's report on the general sanitary circumstances and administration of the St. Neot's and Eaton Socon Rural Districts. 15 pp., fcp. London, 1907.

——— Dr. Theodore Thomson's report on an outbreak of enteric fever in the borough of Mansfield. London, 1907.

Dr. R. J. Reece's report on the Sanitary Circumstances and Administration of the Trowbridge Urban District, with special reference to the appointment of an Inspector of Nuisances. 16 pp., fcp. London, 1907.

W. H. Power, C.B., F.R.S.

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* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

Local Government Board for Ireland. Report on the Sanitary Circumstances of the City of Dublin, with special reference to the causes of the high Death-rate, by Surgeon-Colonel D. Edgar Flinn. 77 pp., 8vo. Dublin, 1906. *Purchased.*

London. *Public Health Department.* Report of Sanitary Committee, submitting a report from the Medical Officer of Health for the City of London, relative to the Second Interim Report of the Royal Commission appointed to inquire into the relations of Human and Animal Tuberculosis. 24 pp., fcp. London, 1907. *W. Collingridge, M.D., D.P.H.*

Miles, *Eustace, M.A.* Builders of the Body. 179 pp., 8vo. London, 1907. *G. Philip & Son, Ltd. (publishers).*

New York. *State Department of Health.* Proceedings of the Sixth Annual Conference of Sanitary Officers, 1906. 242 pp., 8vo. Albany, 1906.

——— *State Department of Health.* Extract from the Twenty-seventh Annual Report, 1906. 44 pp., 8vo. Albany, 1907. *E. H. Porter, M.D., Commissioner.*

Paschayan-Khan, *G. H.* Traité d'Hygiène scolaire. 679 pp., 8vo. Alexandria, 1905. *The Author.*

Rome. Annali d' Igiene Sperimentale. 195 pp., 8vo. Rome, 1906.

Royal Commission on Tuberculosis. Second Interim Report. Part II. Appendix. Volume IV. Comparative Histological and Bacteriological Investigations, by Arthur Eastwood, M.D. 292 pp., fcp. London, 1907. *Purchased.*

Tasmania. Report on the Results of a Medical Examination of over 1,200 children attending State Schools in Hobart: with notes on a similar Examination of 51 children attending the Campbell Town State School, and of the 35 inmates of the Boys' Training School. 26 pp., fcp. Hobart, 1906.

——— Report on an Outbreak of Milk-borne Typhoid at Zeehan, 1906. 9 pp., fcp. Hobart, 1906. *J. S. C. Elkington, M.D., D.P.H.*

U.S.A. Public Health and Marine Hospital Service Report, April, 1907. 40 pp., 8vo. Washington, 1907. *The Surgeon-General, U.S. Army.*

Wernicke, *Professor Dr., and* **Weldert,** *Dr.* Untersuchungen über das von Wernicke angegebene Verfahren der gegenseitigen Enteisenung und Entbräunung von Eisenhaltigen und durch Huminstoffe braun gefärbten Grundwässern. 28 pp., 8vo. *The Authors.*

LIST OF EXHIBITS ADDED TO MUSEUM.

Specimens of Faulty Plumbing Work. A self-called plumber was found repairing lead water-service pipes in this manner, in a very highly rated house in Chelsea. *Dr. Louis C. Parkes, Chelsea.*

One ½″ dia. "Stirlo" Patent Ball Valve, Croydon pattern.
 ,, ½″ ,, ,, ,, Portsmouth ,,
Provided with a screw attachment for adjusting the floating ball. *Wm. Furniss & Son, Old Ford, E.*

Framed Photographs of Water Vans, etc., awarded medal at Health Exhibition of The Royal Sanitary Institute, Bristol, July, 1906. *Wm. Glover & Sons, Ltd., Warwick.*

Fresh Air Inlet Valve for Drains (galvanised iron), with mica flap at an angle of 45° to close more firmly, and protected in front by louvred grating. *F. W. Barker & Co., Westminster Bridge Rd.*

Piece of Sheet Lead, with four perforations caused by some insects. Removed from a lead flat. *S. H. Knick, Walton-on-Thames.*

NEW PREMISES FUND.

	£	s.	d.
Amount Allotted by Council	9,000	0	0
Cash received in Donations, etc., 1899–1906 ...	1,338	19	0
Promises of Donations & Subscriptions, already reported to Dec. 31, 1906	1,009	13	6
Promises of Donations to the Douglas Galton Gallery	110	10	0
Contributions, 1907, already reported	8	7	6

Contributions since last Report.

Thomas Lowe	1	1	0
James Stewart	1	11	6

May 24th, 1907.

BILLS BEFORE PARLIAMENT.

The Council, at their last meeting, decided to forward a petition to Parliament in favour of the Municipal Milk Depots Bill, which is now being considered by the House of Commons.

The object of the Bill, which is presented by the Rt. Hon. John Burns, the President of the Local Government Board, and supported by Dr. Macnamara, is to authorise and regulate the establishment of milk depots by certain local authorities.

OBITUARY.

We report with deep regret the death of two of the Vice-Presidents of the Institute, Sir Benjamin Baker, K.C.B., K.C.M.G., and Sir Joseph Fayrer, Bart., K.C.S.I. It is proposed to give obituary notices in the Journal issued in July.

SANITARY AND COLONIAL NEWS.

The Preliminary Programme of the Second International Congress on School Hygiene, which is to be held in the University of London from August 5th to 10th, 1907, is now ready.

Patron—HIS MOST GRACIOUS MAJESTY THE KING.

Vice-Patron—H.R.H. THE PRINCE OF WALES.

President—SIR LAUDER BRUNTON, LL.D., M.D., F.R.C.P., D.Sc., F.R.S.

Sections and Presidents—

I.—"The Physiology and Psychology of Educational Methods and Work.
President: Sir JAMES CRICHTON-BROWNE, K.T., J.P., M.D., LL.D., F.R.S.

II.—"Medical and Hygienic Inspection in School."
President: Prof. WM. OSLER, LL.D., F.R.C.P., M.D., D.SC., F.R.S.

III.—"The Hygiene of the Teaching Profession."
President: T. J. MACNAMARA, M.P., LL.D.

IV.—"Instruction in Hygiene for Teachers and Scholars."
President: Sir WILLIAM J. COLLINS, M.P., D.L., J.P., M.D., M.S.

V.—"Physical Education and Training in Hygiene."
President: Sir JOHN W. BYERS, M.A., M.D., M.CH., M.A.O.

VI.—"Out of School Hygiene, Holiday Camps, and Schools. The Relation of Home and the School."
President: The Rt. Hon. LORD KINNAIRD, F.R.G.S., D.L., J.P.

VII.—"Contagious Diseases, Ill-health, and other Conditions affecting Attendance."
President: Sir SHIRLEY F. MURPHY, M.R.C.S.

VIII.—"Special Schools for Feeble-Minded and Exceptional Children."
President: W. H. DICKINSON, M.P., J.P., D.L., B.A.

IX.—"Special Schools for Blind, Deaf, and Dumb Children."
President: The Rt. Hon. THE EARL OF CREWE, P.C.

X.—"Hygiene of Residential Schools."
President: CLEMENT DUKES, J.P., M.D., B.S., F.R.C.P.

XI.—"The School Building and its Equipment."
President: THOMAS EDWARD COLCUTT, Pres. R.I.B.A.

LECTURES TO THE CONGRESS.

TUESDAY, AUGUST 6TH.

8 p.m.—On "The Effect of School Training on Mental Discipline and Control in Adolescence," by THE RIGHT REV. BISHOP WELLDON, D.D., Dean of Manchester.

THURSDAY, AUGUST 8TH.

8 p.m.—On "Hygiène du Sport pour les Femmes et Filles," par Mons. le DR. DOLÉRES, des Hôpitaux de Paris, Membre de l'Académie de Médecine.

FRIDAY, AUGUST 9TH.

8 p.m.—On "Ueber Beziehungen zwischen Medizin und Paedogogik," von Prof. Dr. med. et phil. GRIESBACH, Vorsitzender des Allgemeinen deutschen Vereins für Schulgesundheitspflege, Mülhausen (Elsass).

SET SUBJECTS FOR DISCUSSION AT FOUR GENERAL MEETINGS.

1.—Methods for the first and subsequent Medical Examinations of School Children.

W. LESLIE MACKENZIE, M.A., M.D., D.P.H., Medical Member, Local Government Board, Edinburgh.

MONS. LE DR. MERY, Professeur agrégé à la Faculté de Médecine de Paris, Médecine des Hôpitaux.

DR. HEINRICH KOKALL, Stadtphysikus-Stellvertreter in Brünn.

2.—School Work in relation to:—

a. The duration of the lessons;
b. The sequence of the subjects;
c. The season of the year.

WILLIAM H. BURNHAM, PH.D., Assistant Professor of Pedagogics, Clark University, Worcester, Mass., U.S.A.

MONS. CHABOT, Professeur de l'Education à la Faculté des Lettres de Lyon.

DR. LEO BURGERSTEIN, k. k. Professor, Privat-dozent an der Universität, Vienna.

3.—The School and its relation to Tuberculosis.

ARTHUR NEWSHOLME, M.D., F.R.C.P., D.P.H., Medical Officer of Health, Brighton.

MONS. LE DR. J. COURMONT, Professeur d'Hygiène à la Faculté de Médecine de Lyon.

DR. SCHUMBURG, Generaloberarzt, Professor an der Universität Strassburg.

4.—The Lighting and Ventilating of Class-rooms.

SIR ASTON WEBB, R.A., F.R.I.B.A.

MONS. LE DR. R. DINET, Secrétaire Général adjoint de la Ligue française pour l'Hygiène Scolaire.

DR. WILHELM PRAUSNITZ, o. ö. Professor der Hygiene und Vorstand des hygienischen Institutes der k. k. Universität Graz.

EXHIBITION OF SCHOOL BUILDING AND FURNISHING APPLIANCES.

In order, as far as possible, to illustrate practically matters coming under the consideration of the Congress, an Exhibition will be organised and arranged in the University Building by The Royal Sanitary Institute, in which the planning, construction, and equipment of school buildings will be illustrated, and school furniture and teaching appliances of all kinds exhibited.

THE ROYAL SANITARY INSTITUTE.

ARTICLES RELATING TO PUBLIC HEALTH,*

Appearing in the chief British and Foreign Journals and Transactions.

Abstracts of Titles classified in this List under the following headings:—

Science in Relation to Hygiene and Preventive Medicine.
Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.
Building Materials, Construction, and Machinery.
Water Supply, Sewerage, and Refuse Disposal.
Heating, Lighting, and Ventilating.
Personal and Domestic Hygiene.

The articles referred to in this list are as far as possible collected and filed in the Library of the Institute for the use of the Members and Associates.

Science in Relation to Hygiene and Preventive Medicine.

BEALE, J. F. An outbreak of typhoid fever due to eating clams from a polluted source. *Sanitary Record*, 4th April, 1907, p. 286.

Of the persons partaking of the clams, three developed typhoid fever, the others diarrhœa and sickness. The clams were found to be grossly polluted with sewage. It was found that boiling for as long as a quarter-hour did not render such shell-fish fit for consumption.

KORN AND KAMMANN. The Hamburg test for putrescibility. *Gesundheits-Ingenieur*, 1907.

A criticism of the tests used to determine the putrescibility of a sewage effluent, and a description of a new test used in the Institute of State Hygiene in Hamburg.

MACFADDEN, A. W. J. Lead and arsenic in tartaric acid, citric acid, and cream of tartar. *Report to Local Government Board*, 16th March, 1907.

An inquiry into the occurrence of lead and arsenic in tartaric acid, etc., used in preparation of beverages. Recommends that in these drugs lead should not exceed $\frac{1}{7}$th grain per lb., and arsenious oxide $\frac{1}{100}$th grain per lb.

Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.

MAPLETON, H. B. Annual report for 1906 of the Medical Officer of Health for Newton Abbot and Dawlish Sanitary Districts.

Includes criticism of the amount of domestic consumption of water in rural districts, and shows that much is due to waste by consumer. Recommends that

* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

water consumed above 20 gallons per head per day should be charged for per gallon.

Water Supply, Sewerage, and Refuse Disposal.

CRIDER, A. F., and JOHNSON, L. C. Summary of the underground-water resources of Mississippi. *U.S. Govt. Surv.* (Water Supply Paper 159), 1906.

Sanitary Aspect of Wells, pp. 74, 75. Notices the dangers of open wells.

MATTHEWS, E. R. Waterworks construction in America. Read before the Society of Engineers, 6th May, 1907.

Description of the construction of covered reservoirs for water supplies.

SCHWEIKERT, H. Purification of water by means of ferric hydrate. *Chemiker Zeitung*, XXXI., p. 16.

Addition of colloidal ferric hydrate solution to a water assists in formation of slimy layer on top of a sand filter. Gives a method for preparation of the reagent without dialysis.

Personal and Domestic Hygiene.

SOMMERVILLE, D., and AINSLIE-WALKER, J. T. The standardisation of disinfectants in the presence of organic matter. *Sanitary Record*, 9th May, 1907, p. 391.

Gives the fall in the carbolic acid co-efficients of certain disinfectants when tested by the Rideal-Walker method in presence of two and three per cent. of various organic matters.

MEETINGS HELD.

SESSIONAL MEETING.

Plymouth, May 31st and June 1st.—The meeting was held in Western Law Courts, Guildhall, when a discussion on "Infantile Mortality" was opened by Major R. J. Blackham, R.A.M.C. The chair was taken by Col. J. Lane Notter, M.A., M.D., R.A.M.C.

Visits were made on Saturday to the Royal Dockyard and the Plymouth Co-operative Society's Bakery.

EXAMINATIONS.

The following Examinations have been held:—

Sanitary Science as Applied to Buildings and Public Works.

April 5th and 6th, Cape Town. 1 candidate, who was granted a certificate.
June 7th and 8th, Leeds. 2 candidates, no certificate granted.
June 14th and 15th, Norwich. 1 candidate, no certificate granted.
June 21st and 22nd, Manchester. 2 candidates, 1 certificate granted.

Inspectors of Nuisances.

March 25th and 26th, Kimberley. 7 candidates, 3 certificates granted.
April 11th and 13th, Perth. 9 candidates, 8 certificates granted.
June 7th and 8th, Leeds. 35 candidates, 19 certificates granted.
June 14th and 15th, Norwich. 12 candidates, 7 certificates granted.
June 21st and 22nd, Manchester. 45 candidates, 22 certificates granted.

Hygiene in its bearing on School Life.

June 7th and 8th, Leeds. 26 candidates, 12 certificates granted.
June 14th and 15th, Norwich. 13 candidates, 7 certificates granted.
June 21st and 22nd, Manchester. 12 candidates, 9 certificates granted.

Inspectors of Meat and other Foods.

May 31 & June 1, London. 54 candidates, 35 certificates granted.

Candidates who have received Certificates.

Sanitary Science as applied to Buildings and Public Works.

Cargill, James Paulet.
Montgomery, Hugh.

Inspectors of Nuisances.

Ashby, Alfred.
Bamforth, Frank.
Bates, George.
Bradley, Annie Elizabeth.
Brown, Charles.
Bushell, Frederick Howard.
Butters, Joseph B.
Clarke, Reginald Charles.
Collidge, Alexander.
Edwards, Constance.
Firth, Charles.
Foxcroft, Frank.
Gibson, Lucy Marian.
Glover, John Henry.
Grayshon, Thomas.
Green, Sidney.
Greenwood, Thomas Fenton.
Greenwood, Willie.
Hampson, Thomas George.
Hancock, Joseph Henry.
Hattersley, William Henry.
Hay, José Guillermo.
Hicks, Franklyn.
Higham, Thomas Edwin.
Huelin, Frederick James.
Hunter, Annie.
Lord, Ann.
McKowen, Alice.
Mellor, James.
Mellor, John William.
Miller, John.
Monks, James.
Moore, Thomas James.
Moss, Thomas.
Mosson, William.
Moulds, Charles.
Muirhead, William Alexander.
Oakes, Frederick Harold.
Pearson, Dyson.
Petherick, Hugh Wright.
Pollard, Herbert Edward.
Purdie, Charles McMillan.
Rayner, Robert John.
Read, Robert.
Riley, John.
Roberts, Joseph.
Seaman, William John.
Seed, May G.
Sharwood, Sidney Edward.
Skelton, Philip Brown.
Smyth, Ellen.
Tattersall, Herbert.
Teal, Fred.
Thorrold, John Favell.
Todd, William Henry.
Trott, John Daniel.
Vosper, Lavinia.
Walton, William Henry.
Wilkinson, Thomas Rowland.

Inspectors of Meat and other Foods.

ARMSTRONG, WILLIAM MEREDITH HOWARD, *Major, A.S.C.*
BROWN, HERBERT EDWARD.
CLARK, GEORGE FREDERICK.
CLARKE, JOHN HENRY.
FLINT, ERNEST WILLIAM.
HILL, PERCY HARRY.
HOWARD, FRANCIS JAMES LEIGH, *Major A.S.C.*
HUNT, WILFRED JOHN LACY.
JONES, JOHN.
KEMP, ARTHUR GODFREY.
KILNER, EDWARD.
KINCH, MAURICE WHINLEY.
KINCH, STANLEY ASHER.
KING, HENRY.
KNAPPETT, BENJAMIN ALBERT.
KRAMM, ALBERT BERNARD.
LARARD, SAMUEL.
LAWRENCE, SIDNEY CAMERON.
MALINS, MAURICE.
MEARS, ERNEST LENNOX, *Capt. A.S.C.*
PAYNE, THOMAS.
PLANT, JOHN GEORGE.
RAWLINGS, JOHN JACKSON.
RAYNER, SIDNEY PARKER.
REID, FREDERICK JAMES, *Capt., A.S.C.*
RICHARDS, EVAN.
ROBINSON, CLEMENT MAYBURY.
ROLFE, JOHN HENRY.
SAVAGE, FRANK H.
SHARP, HAROLD GIBBON.
SMITH, GEORGE ALFRED.
STOKES, WILLIAM HENRY.
THOMAS, ARTHUR.
WHITE, ROBERT.
WOOD, ERNEST, *Capt., A.S.C.*

Hygiene in its bearing on School Life.

ALDERSON, HARRIET.
BARKER, LAVINIA.
BELLOWS, LUCY.
BOLTON, JAMES.
COUNSELL, THOMAS.
DAKIN, BERTRAM ALEXANDER.
DUTHIE, HELEN WILSON.
GETTINGS, DOROTHY HELEN.
GILL, SELINA.
GREENWOOD, THOMAS FENTON.
HALL, MARGARET ANN.
HUGHES, CLARA.
LISTER, ANNIE ELIZABETH.
MACDONALD, CLARA.
PLATT, EDITH ANNIE.
POOLE, ADA.
ROBERTS, MYERS.
ROBERTS, RUTH AMANDA.
TROTTER, IRENE MAY.
TURNER, CLARICE.
WEBB, EDITH MAY.

FORTHCOMING MEETINGS.

VISIT TO GARDEN CITY, LETCHWORTH, SATURDAY, JULY 27TH.

By kind invitation of First Garden City, Ltd., a visit has been arranged to the Urban Housing Exhibition, Letchworth, on July 27th, where the new Model Houses, recently erected, will be inspected.

Examinations.

In Sanitary Science as applied to Buildings and Public Works,
Inspectors of Nuisances,
In Hygiene in its bearing on School Life,

Birmingham, July 5th and 6th. *Cardiff*, July 19th and 20th.

Calendar, July and August, 1907.

As far as at present arranged.

Council Meetings are held Monthly on the Second Wednesday in each Month and the Standing Committees in the preceding week.

Exhibition Committee . . Congress and Editing Committee	Monday in the week preceding the Council, at 4.30 p.m. & 5.30 p.m.
Examination Committee . . Museum and Library Committee	Tuesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Special Purposes Committee . Finance Committee . . .	Wednesday in the week preceding the Council, at 4 p.m. and 5 p.m.
Parliamentary Committee . . New Premises Committee . . Disinfectant Standardisation Committee	As occasion requires.

The Parkes Museum is open free, on Mondays 9.30 a.m. to 8 p.m., other days 9.30 a.m. to 5.30 p.m. The Library and Office are closed at 1 p.m. on Saturdays.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

JULY.

5 6	F. S.	Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Birmingham.
19 20	F. S.	Examination in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Cardiff.
27	S.	**Visit to Exhibition at Garden City, Letchworth.**

AUGUST.

5—14 **International Congress and Exhibition on School Hygiene, London.**

FELLOWS, MEMBERS, AND ASSOCIATES ELECTED,

JUNE, 1907.

Reg. No. Date of Election.

FELLOWS.

1808 1907. June. CAMERON, Sir Charles Alexander, C.B., M.D., D.P.H., F.R.C.P., F.R.C.S., F.I.C. (*M.O.H.*), 51, *Pembroke Road, Dublin.*

1079 1907. June. CARTER, George Fearnley, M.INST.C.E., *Borough Engineer, Croydon.*

1242 1907. June. HANDFORD, Henry, M.D., F.R.C.P., D.P.H. (*M.O.H.*), *County Council Offices, Shire Hall, Nottingham.*

1988 1907. June. MCWEENEY, Prof. Edmond J., M.A., M.D., D.P.H., 84, *St. Stephen's Green, Dublin.*

2075 1907. June. MELVILLE, Lt.-Col. Charles H., R.A.M.C., M.B., C.M., D.P.H., 91, *Victoria Street, S.W.*

968 1907. June. SCURFIELD, H., M.D., C.M., D.P.H. (*M.O.H.*), *Edenthorpe, Tapton Park Road, and Town Hall, Sheffield.*

585 1907. June. WALLIS, Mrs. Isabel White, *Upper Frognal Lodge, Hampstead, N.W.*

MEMBERS.

*** Marked thus have passed the Examination in Sanitary Science as applied to Buildings and Public Works.**

‡ Marked thus have passed the Examination for Inspectors of Nuisances.

M Marked thus have passed the Examination for Inspectors of Meat and Other Foods.

2260 1907. June. *BENDING, Frank Bausor, 7, *Park Street, Tunbridge Wells.*

2261 1907. June, *CROSSLEY, Horace Basil, *Florencia, York Road, Guildford.*

2262 1907. June. *CRUMP, William George, 25, *Temple Street, Brighton.*

2263 1907. June.‡*DAVIES, George, *Public Offices, Blaenau-Festiniog.*

2254 1907. June. DAVIES, Harold Cliffe, P.A.S.I., 167, *Old Chester Road, Birkenhead.*

2264 1907. June. *FOSTER, William Frederick, 24, *Heslop Road, Balham.*

2255 1907. June. HARCOURT, Arthur Percival, *Port Elizabeth New Water Works, District Uitenhage, Cape Colony.*

2256 1907. June. LEWIS, Horace Mersham, *Town Hall, Staines.*

2265 1907. June.‡*MARCHANT, Frederick Thomas, 41, *Maitland Park Road, Haverstock Hill, N.W.*

2266 1907. June. *M* PAINE, Richard, F.R.C.V.S., *Dept. of Agriculture, Cape Town.*

2267 1907. June. *PEARCE, Walter Ernest, *West Wycombe Road, High Wycombe.*

2257 1907. June. REES, Morgan James, M.D., M.R.C.S., L.R.C.P., D.P.H. *(M.O.H.), Town Hall, Aberdare, Glam.*

2268 1907. June. *SHARPLESS, Arthur, 97, *Raleigh Road, Hornsey, N.*

2258 1907. June. SMITH, Henry Joseph Trivess, A.M.INST.C.E., *Municipal Offices, Calcutta.*

2269 1907. June. *SLOAN, Thomas M., *Cork.*

2270 1907. June. *THOMAS, Ernest, 31, *River Street, Todmorden.*

2259 1907. June. WOODS, Ernest L., ASSOC.M.INST.C.E.I., *Town Surveyor, Town Hall, Bangor, Ireland.*

2271 1907. June. *M* YOUNG, William Jackson, M.R.C.V.S., 39, *Leamington Terrace, Edinburgh.*

ASSOCIATES.

‡ Marked thus have passed the Examination for Inspectors of Nuisances.
***S* Marked thus have passed the Examination in Practical Hygiene for School Teachers.**
***M* Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.**

4150 1907. June. ‡BARKER, Miss Ethel Gomme, 25, *Worsley Road, Crouch End, N.*

4151 1907. June. ‡BARNES, Robert, 16, *Downham Road, Birkenhead.*

4152 1907. June. ‡BEW, Charles Alfred William, 30, *Pennard Road, Shepherd's Bush, W.*

4153 1907. June. ‡BIRCH, Miss Sarah Alice, 13, *Park Street, Newlands, Morecambe.*

4154 1907. June. ‡BOWKER, Thomas Enoch, 8, *Ash Meadows, Kendal.*

4155 1907. June. ‡BRAMELD, Godfrey Neville, 46, *Rainsford Road, Chelmsford.*

4156 1907. June. ‡BRAZIER, Frederick Price, 21, *Southcote Road, Bournemouth.*

4157 1907. June. †BROOKS, Ernest W., 101, *Mill Hill Road, Acton, W.*

4158 1907. June. *M* CAMERON, Alexander, *Bellshill Slaughterhouse, Lanarkshire, N.B.*

4159 1907. June. ‡CHAPMAN, Miss Edith Mary, 54, *St. Augustine's Avenue, S. Croydon.*

4160 1907. June. ‡CULLIS, Frederick Edward, *East Grove, Barnwood, Gloucester.*

4161 1907. June. ‡DAVIES, Frank, 57, *Murchison Road, Leyton, Essex.*

4162 1907. June. ‡EARP, Edwin Harry, *Thoresby, Ollerton, near Newark.*

4163 1907. June. ‡EASTWOOD, Charles William, 3, *Brunswick Grove, Hessle.*

4164 1907. June. *s* FENWICK, Miss Agnes Jane, *Weybourne House, Guildford.*

4165 1907. June. ‡FROST, William, Junr., 11, *Cabul Road, Battersea, S.W.*

4166 1907. June. ‡FULCHER, Peter, 40, *Orchard Street, Cambridge.*

4167 1907. June. ‡GROVES, Walter Edwin, 4, *Alexandra Terrace, Tisbury, Wilts.*

4168 1907. June. ‡HACKING, Thomas, *Bigods Hall, Dunmow, Essex.*

4169 1907. June. ‡HARPER, Frank Bartholomew, 55, *Waterloo Road, Bedford.*

4170 1907. June. ‡HARRIS, Alfred, *Darran Bridge, Risca, Mon.*

4171 1907. June. ‡HOWARD, Miss Nellie, 55, *Algiers Road, Ladywell, S.E.*

4172 1907. June. ‡JOHNSON, Alfred Barr, 156, *Walkden Road, Walkden, near Manchester.*

4185 1907. June. ‡LYNE, J., 15, *James Street, Walthamstow.*

4173 1907. June. ‡MACMILLAN, Robert Speirs, 10, *Bonaby Place, Merchiston, Edinburgh.*

4174 1907. June. ‡MERRILES, Andrew Guthrie, 17, *Archibald Place, Edinburgh.*

4175 1907. June. ‡MUIRHEAD, Samuel Francis, 6, *Abercromby Terrace, Liverpool.*

4176 1907. June. PARSONS, Alfred James, 66, *Kingwood Road, Balham, S.W.*

4177 1907. June. ‡PETER, Henry Thomas, 11, *Pond Street, Hampstead, N.W.*

4178 1907. June. ‡PHILP, Daniel Thomas, *Devonhurst*, 44, *Homefield Road, Chiswick.*

4179 1907. June. ‡RANDALL, Miss Elsie Orange, 2, *Fernbank, Amherst, Guernsey.*

4180 1907. June. ‡READ, Ernest, *Sawbridgeworth, Hertford.*

4181 1907. June. RYAN, Miss Clara J., 18, *Ellerdale Rd., Hampstead, N.W.*

4182 1907. June. ‡SIMKIN, Frederick, *Clifford House, Gowerton, Glam.*

4183 1907, June. ‡THORPE, Miss Mary Agatha, 11, *Stratford Road, Kensington.*

4119 1907. June. TOMLIN, Miss Helen Eastwick, 1, *White Rock Gardens, Hastings.*

4141 1907. June. ‡WINTER, Joseph B., *Langton Cottage, Eccleston, near Chorley.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.*

DURING MAY, 1907.

*** *For Publications of Societies and Institutions, etc., see under "Academies."*

ACADEMY (AMERICAN).

American Climatological Association. Transactions of, 1906, with Index to Vols. 1–21. 383 pp., 8vo. Philadelphia, 1906. *The Association.*

ACADEMIES (BRITISH).

London. Transactions of the Surveyors' Institution. Volume XXXIX., Parts X. and XI. 52 pp., 8vo. London, 1907. *The Institution.*

——— *St. Thomas's Hospital.* Reports, New Series, 1905. 637 pp., 8vo. London, 1906. *The Hospital.*

——— Transactions of the Society of Engineers, 1906, and General Index, 1857–1906. 322 pp., 8vo. London and New York, 1907. *The Society.*

——— *The Institution of Mechanical Engineers.* President's Address, Spring Meeting, 1907. 40 pp., 8vo. London, 1907. *T. Hurry Riches, President.*

——— *The Institution of Mechanical Engineers.* List of Members, 1st March, 1907. 266 pp., 8vo. London, 1907. *The Institution.*

——— *The Lister Institute of Preventive Medicine.* Collected Papers, No. 3. 590 pp., 8vo. London, 1906. *The Institute.*

Dublin. *Department of Agriculture & Technical Instruction for Ireland.* Report of the Director of the Institutions of Science and Art, 1905–6. 31 pp., 8vo. Dublin, 1907. *G. T. Plunkett, Director.*

Allen, *J. K.* Sanitation in the Modern Home. 271 pp., 8vo. Chicago, 1907.

——— Fifty Plumbing Charts. 50 pp., 8vo. Chicago, 1907.

——— Testing Drainage, Plumbing, & Gas-piping. 36 pp., 8vo. Chicago, 1907. *The Author.*

Architects' and Surveyors' Directory and Referendum. 478 pp., 4to. London, 1907. *The Editor.*

Berne. Resultats du recensement fédéral des entreprises agricoles, industrielles et commerciales du 9 août, 1905. 494 pp., 4to. Berne, 1907.

——— Mouvement de la Population de la Suisse during the year 1905. 32 pp., 4to. Berne, 1907. *Bureau de Statistique.*

Freeman, *A. C.* An Address delivered before the Society of Architects, Jan. 18th, 1906, on "Cremation: The Planning of Crematoria and Columbaria." 20 pp., 8vo. London, 1906. *The Author.*

Kirk, *Florence.* Educational Handwork and Systematic Colour Instruction. 188 pp., 4to. Leeds, 1907. *The Author.*

* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

Local Government Board. Dr. Theodore Thomson's report on the Sanitary Circumstances and Administration of the Hambledon Rural District. 5 pp., Fcp. London, 1907.

——— Dr. E. P. Manby's report on the Sanitary Circumstances and Administration of the Brecknock Rural District. 10 pp., Fcp. London, 1907.

——— Dr. Reginald Farrar's report on the Sanitary Circumstances and Administration of the Ebbw Vale Urban District, with special reference to the prevalence of infectious diseases therein. 28 pp., Fcp. London, 1907.

——— Dr. J. Spencer Low's report on the Sanitary Circumstances of the Aberdare Urban District, with special reference to the continued prevalence of infectious disease. 26 pp., Fcp. London, 1907.

——— Inspector of Foods Report (No. 2). Lead and Arsenic in Tartaric Acid, Citric Acid, and Cream of Tartar. 10 pp., Fcp. London, 1907.

——— Dr. J. Spencer Low's report on the Sanitary Circumstances and Administration of the Mitford and Launditch Rural District, and on the prevalence of Diphtheria in the parish of Guist in that district. 14 pp., Fcp. London, 1907. *W. H. Power, C.B., F.R.S.*

— — **Board of Education, Home Office, Treasury.** Departmental decisions by the, Quarterly issue, December, 1906. 66 pp., 8vo. London, 1906. *S. E. Rogers (publisher).*

Lord, *John P.* The Dangers of Sludge. 11 pp., 8vo.

——— Liquid Sewage: Its Dangers and Disposal. 10 pp., 8vo.

——— Sewer Gas and Sanitation. 10 pp., 8vo. *J. E. Webb, C.E.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, Feb., Mar., and Apr., 1907	*Matthew Hay, M.D.*
„ 1906 (Sanitary Inspector's)	*Kenneth Cameron.*
Acton U.D.C., 1906	*D. J. Thomas, M.R.C.S., D.P.H.*
Bexhill, 1906	*Oswald Osborne, M.R.C.S., L.R.C.P.*
Blackburn, 1906	*A. Greenwood, M.D., D.P.H.*
Blackpool, 1906	*F. J. H. Coutts, M.D., D.P.H., F.C.S.*
Bournemouth, 1906	*P. W. G. Nunn, M.R.C.S.Eng.*
Bourne R.D.C., 1906	*J. W. Burdwood, L.S.A., M.O.H.*
Bradford. Quarterly Report of the Work of the Women Sanitary Inspectors, March, 1907	*Miss E. H. Jones, A.R.San.I.*
Bridlington, 1906	*A. Forrest, M.A., M.B., C.M.*
Brighton, 1906	*A. Newsholme, M.D., F.R.C.P.*
Bucklow R.D., and **Knutsford, Middlewich, Winsford,** and **Biddulph U.D.,** 1906	*T. W. H. Garstang, M.A., D.P.H.*

Chesterfield, 1906	*H. Peck, M.D., D.P.H.*
Chesterfield R.D.C., 1906	*H. Peck, M.D., D.P.H.*
Clayton-le-Moors, 1906	*C. H. Tattersall, L.R.C.P., M.R.C.S.*
Coventry, 1906	*E. H. Snell, M.D., B.Sc., F.R.S.E.*
Crewe, 1906	*A. J. Laird, M.D., D.P.H.*
Darwen, 1906	*F. G. Haworth, M.B., C.M., D.P.H.*
Eastbourne, 1906	*W. G. Willoughby, M.D., D.P.H.*
East Ham, 1906	*G. Sowden, M.D., D.P.H.*
Eccles, 1906	*W. M. Hamilton, M.D., D.P.H.*
Edinburgh (Engineer's), 1906 ..	*James Massie, City Engineer.*
Exeter, 1906	*E. A. Brash, L.R.C.P.*
Failsworth U.D.C., 1906	*G. S. Leslie, M.B., C.M.*
Georgetown, (Town Superintendent's), 1906	
Gloucestershire, Annual Report of the Highways and General Purposes Committee, 1907	*R. Phillips, County Surveyor.*
Hampstead, 1906	*G. F. McCleary, M.D., D.P.H.*
Harrow-on-the-Hill, 1906	*J. Fletcher Little, M.B., M.R.C.P.*
Hereford, 1906	*H. C. Moore, M.R.C.S., L.S.A.*
Huddersfield, 4th quarter, 1906 ..	*S. G. Moore, M.D., D.P.H.*
Johannesburg (Town Engineer), year ending 30th June, 1906	*G. S. Burt Andrews, M.Inst.C.E.*
Kincardine C.C., 1906	*W. A. Macnaughton, M.D., D.P.H.*
London, City of, 1906	*W. H. Collingridge, M.D., D.P.H.*
London, Port of, Sanitary Committee, 1906	*H. Williams, M.D., D.P.H., M.R.C.S.*
London, City of, Four weeks ending 16th March, 1907	*W. Collingridge, M.D., D.P.H.*
——— Five weeks ending 18th May, 1907	" "
Middlesborough, 1906	*Geo. H. Anderson, Chief San. Inspector.*
Midlothian, San. Inspector's, 1906 ..	*R. Lindsay.*
New Windsor, 1906	*Edward Casey, M.B., M.D.*
Penge U.D.C., 1906	*H. J. Prangley, M.R.C.S., L.R.C.P.*
Richmond, 1906	*J. H. Crocker, M.D., D.P.H.*
Southport, 1906	*J. J. Weaver, M.R.C.S., D.P.H.*
Southport, Meteorological Report, 1906	*J. Baxendell, F.R.Met.Soc.*

Stoke Newington, 1906	*Henry Kenwood, M.B., D.P.H., F.C.S.*
Surbiton U.D.C., 1906	*Owen Coleman, M.D., D.P.H.*
Surrey, 1906	*E. C. Seaton, M.D., F.R.C.P.*
Swindon, 1906	*F. E. Streeten, M.D., D.P.H.*
Tunbridge Wells, 1906	*James Cave, Sanitary Inspector.*
West Bromwich, 1906	*H. Manley, M.D., D.P.H.*
Westminster, Report on the Statistics and Sanitary Condition relating to, 1906	*F. J. Allan, M.D., D.P.H.*
Wimbledon, 1906	*E. Pocklington, M.R.C.S.*
Woking, 1906	*R. W. C. Pierce, M.D., D.P.H.*
Woking U.D.C. (San. Inspector's, 1906)	*J. H. Ablett, Sanitary Inspector.*

Metropolitan Asylums Board. Annual Report for the Year 1906. 350 pp., 8vo. London, 1907. *The Board.*

Newcastle-upon-Tyne. Report on Tuberculosis: its casualties, causes, and control. 56 pp., 8vo. Newcastle-upon-Tyne, 1907. *H. E. Armstrong, D.Hy.*

NEW PREMISES FUND.

	£	s.	d.
Amount Allotted by Council	9,000	0	0
Cash received in Donations, etc., 1899–1906 ...	1,338	19	0
Promises of Donations & Subscriptions, already reported to Dec. 31, 1906	1,009	13	6
Promises of Donations to the Douglas Galton Gallery	110	10	0
Contributions, 1907, already reported	11	0	0

June 17th, 1907.

THE ROYAL SANITARY INSTITUTE.

ARTICLES RELATING TO PUBLIC HEALTH,*

Appearing in the chief British and Foreign Journals and Transactions.

Abstracts of Titles classified in this List under the following headings:—

Science in Relation to Hygiene and Preventive Medicine.
Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.
Building Materials, Construction, and Machinery.
Water Supply, Sewerage, and Refuse Disposal.
Heating, Lighting, and Ventilating.
Personal and Domestic Hygiene.

The articles referred to in this list are as far as possible collected and filed in the Library of the Institute for the use of the Members and Associates.

Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.

"BUILDER," EDITOR OF THE. The State of New York Harbour. *Builder*, 22nd June, 1907, p. 747.

Comment on the foulness and the state of sewage pollution of the waters of New York Bay owing to the lack of proper means for the treatment of the sewage.

"ENGINEERING RECORD," THE. Street Cleaning in the Central Business District of Chicago. 25th May, 1907, p. 625.

Detailed description of the method and cost of cleansing an area comprised in 56 city blocks, including 4·9 miles of streets and 1·7 miles of alleys.

MARSHALL MACKENZIE & SON. Competition Design for University College, Bangor. *Builder*, 16th February, 1907, p. 194.

Plans and perspective view, with estimate of cost.

MILLER, JAMES, A.R.S.A. Glasgow New Royal Infirmary. *Builder*, 18th May, 1907, p. 604.

Description of the buildings, with plans and perspective view.

——— Glasgow University, New Medical School. *Builder*, 18th May, 1907.

Description of the buildings, with plans and perspective view.

MITCHELL, ARNOLD. Competition Design for University College, Bangor. *Builder*, 9th February, 1907.

Plans, elevations, and perspective view, with estimate of cost.

Water Supply, Sewerage, and Refuse Disposal.

"ENGINEERING RECORD," THE. The Pollution of New York Harbour. 25th May, 1907, p. 632.

Description of the pollution produced by 500 to 600 million gallons of sewage per day from 350 sewer outlets discharging into the harbour.

* Members or Associates wishing to file or catalogue these Titles car, on application, be supplied with excerpt copies for this purpose.

MEETINGS HELD.

Conference at Dublin.

The Conference was held in the Trinity College, Dublin, from June 25th to 29th, 1907.

The Inaugural Address was given by Sir Charles Cameron, C.B., M.D., on June 25th in Trinity College, Anthony Traill, M.D., LL.D., in the Chair.

The business of the Conference was divided into the three following Sections:—

Section I.—Sanitary Science and Preventive Medicine—

President: Sir Charles A. Cameron, C.B., M.D., D.P.H.

Subjects for discussion—

"Poor Law and Sanitary Administration in Ireland," by Sir Charles A. Cameron, C.B., M.D., D.P.H.

"The Rôle of Sanatoria as a Factor in checking Tuberculosis," by Prof. E. J. McWeeney, M.A., M.D., D.P.H.

Section II.—Engineering and Architecture.

President: P. C. Cowan, B.Sc., M.Inst.C.E.

Subjects for discussion—

"The Economic Housing of the Working Classes in Town and Country," by P. C. Cowan, B.Sc., M.Inst.C.E.

"Could the Existing Statutory and Departmental Requirements as to Sewage Disposal be relaxed in certain case with advantage to the Community?" by W. Kaye-Parry, M.A., F.R.I.B.A., M.Inst.C.E.

Section III.—Physics, Chemistry, Biology, and Meteorology.

President: Sir John William Moore, M.D., D.P.H., Hon. D.Sc., Oxon.

Subjects for discussion—

"The Climatology of Ireland in relation to Public Health," by Sir John W. Moore, M.D., Hon. D.Sc., Oxon.

"Disinfection considered from a Medical, Chemical, and Meteorological Standpoint," by S. Rideal, D.Sc., F.I.C.

During the meeting excursions and visits were made to Messrs. Guinness's Brewery, St. Patrick's Cathedral, the Iveagh Trust Buildings, the New Main Drainage Outfall Works, Glendalough and the Seven Churches, and Killarney.

The members were graciously entertained at a Garden Party by their Excellencies the Lord Lieutenant and Countess of Aberdeen, and at a Smoking Concert by the Right Hon. Lord Mayor of Dublin.

The numbers attending the Conference were as follows:—Delegates, 365; Members and Associates of the Institute, 75; Associates of Congress, 22; Complimentary and Press, 90; making a total of 552.

Delegates were appointed by 182 Authorities and learned Institutions.

Examinations.

The following Examinations have been held :—

Sanitary Science as applied to Buildings and Public Works.

July 5th and 6th, Birmingham. 3 candidates, no certificate granted.
July 19th and 20th, Cardiff. 8 candidates, 3 certificates granted.

Inspectors of Nuisances.

July 5th and 6th, Birmingham. 33 candidates, 14 certificates granted.
July 19th and 20th, Cardiff. 54 candidates, 28 certificates granted.

Hygiene in its bearing on School Life.

July 5th and 6th, Birmingham. 9 candidates, 7 certificates granted.

Inspectors of Meat and other Foods.

June 28th and 29th, Leeds. 23 Candidates, 16 certificates granted.

Candidates who have received Certificates.

Sanitary Science as applied to Buildings and Public Works.

Andrews, Josiah.
Bowen, David John.
Jones, Thomas.

Inspectors of Nuisances.

Beavan, John.
Beck, Samuel.
Chidsey, William Henry.
Cousins, Walter Horace.
Davies, Elizabeth.
Evans, Joshua.
Evans, Mary.
Evans, Thomas.
Francis, Alfred.
Gange, Frank Belson.
Green, Frank George.
Griffiths, Edward.
Hancox, Ernest Alfred.
Harris, Oliver Plowman.
Hearne, Thomas Henry.
Heaven, Frank Henry.
Hudston, Winifred Mary.
Jones, Elizabeth.
Karslake, Herbert James.
Lord, John Frederick.
Measey, Jonathan Thomas.
Morgan, Edwin.
Morley, Bertie.
Peters, Herbert.
Poole, Frank Arthur.
Powell, William John.
Priest, William Arthur.
Proudfoot, Jane.
Rees, Philip John.
Robinson, Ellis Wynne.
Roe, Ernest Arthur.
Rogers, Arthur Sidney.
Rowe, John Henry, Junr.
Rowles, John Thomas William.
Slim, Thomas.
Smart, Percy.
Smith, Annie Burns.
Spickett, Thomas Lewis.
Thomas, John.
Vallance, John Thomas Jesse.
Williams, Thomas Gower.
Wingfield, William James.

Hygiene in its bearing on School Life.

Beale, Rose Madeline.
Dickson, Kate.
Hall, Belle.
Lawson, Jemima.
Noble, Margaret.
Paton, Alice Helen.
Paton, Augusta Dorothea.

Inspectors of Meat and other Foods.

Bates, George Herbert.
Edmondson, Walter, M.R.C.V.S.
Foster, Arthur Norman, M.R.C.V.S.
Frost, Edmund.
Gough, Thomas.
Horsfall, John Henry.
Lord, John Ernest.
Lupton, John William.
Pilkington, Thomas.
Pindar, Edward Bloye.
Pitts, Charles.
Pollard, George.
Roberts, Joseph.
Savage, William.
Smith, Charles Secker, M.R.C.V.S.
Walker, Charles.

FORTHCOMING MEETINGS.

Calendar, August and September, 1907.

As far as at present arranged.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

AUGUST.

5 M. **August Bank Holiday.**

5—14 **International Congress and Exhibition on School Hygiene, London.**

SEPTEMBER.

16 M. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, A: Introductory Remarks, Public Health Acts—English, Scotch, Irish; other Statutes relating to Public Health; By-laws (Model, etc.), Regulations, Orders, Memoranda, etc., by J. Priestley, B.A., M.D., M.R.C.S., D.P.H., M.O.H. Lambeth.

18 W. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, B: Public Health (London) Act; Metropolis Local Management Acts; By-laws and Regulations in force in the Administrative County of London, by J. Priestley, B.A., M.D., M.R.C.S., D.P.H.

20 F. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, C: Factory and Workshop Acts (including Bakehouse Legislation, 1878–95) as they affect the Sanitary Inspector; Smoke Legislation; Food and Drugs Acts, 1899, by J. Priestley, B.A., M.D., M.R.C.S., D.P.H.

21 S. Inspection and Demonstration of Wimbledon Sewage Works, at about 2.45 p.m. Conducted by C. H. Cooper, M.INST.C.E., Borough Engineer and Surveyor.

23 M. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General, A: Outdoor, by A. Wellesley Harris, M.R.C.S., M.D., D.P.H., M.O.H. Lewisham.

25 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt., Public Health Dept., Borough of Islington.

26 Th. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General B: Indoor, by A. Wellesley Harris, M.R.C.S., D.P.H.

27 F. Lecture—6.30 p.m. Meat Inspectors' Course.

27 F. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—C: Offensive Trades and Trade Nuisances, etc., by A. Wellesley Harris, M.R.C.S., D.P.H.

28 S. Inspection and Demonstration at the Southwark and Vauxhall Water Works, Hampton, at about 2.30 p.m.

30 M. Lecture to Sanitary Officers at 7 p.m. Infectious Diseases, by Prof. A. Bostock Hill, M.D., D.P.H., F.I.C.

MEMBERS AND ASSOCIATES ELECTED,

JULY, 1907.

MEMBERS.

* Marked thus have passed the Examination in Sanitary Science as applied to Buildings and Public Works.

S Marked thus have passed the Examination in Practical Hygiene for School Teachers.

‡ Marked thus have passed the Examination for Inspectors of Nuisances.

M Marked thus have passed the Examination of the Institute for Inspectors of Meat and Other Foods.

2272 1907. July. ALLEN, John Kermatt, 49, *North Jefferson Street, Chicago, Illinois, U.S.A.*

2273 1907. July. ASHURST, J., *Deputy Borough Engineer, Town Hall, Luton.*

2274 1907. July. *S* BARNETT, John, 69, *North Station Road, Colchester.*

2275 1907. July. BUNGARD, Arthur William, 88, *Winston Road, Green Lanes, N.*

2284 1907. July. *CARGILL, William MacGilvray, 48, *Jasper Road, Upper Norwood, S.E.*

2276 1907. July. ‡CLARK, William George Johnson, *Fernleigh, Blaby Road, Wigston Magna.*

2277 1907. July. CLEMESLEA, Capt. William Wesley, I.M.S., M.D., D.P.H., *c/o Grindlay & Co.*, 54, *Parliament Street, S.W.*

2278 1907. July. HIND, R. T., *Chief Assistant Engineer, Callao, Peru.*

2279 1907. July. HOOPER, Edgar Wilfred, F.S.I., 15, *High Street, East Grinstead, Sussex.*

2280 1907. July. ‡KERSHAW, Edward Baxter, *The Nook*, 1, *Pendle Road, Thrale Road, Streatham, S.W.*

2285 1907. July. *M* LAWRENCE, Sidney Cameron, M.B., CH.B., D.P.H., M.O.H., 7, *Latymer Road, Lower Edmonton, N.*

2281 1907. July. NASH, Edwin Hanet Thomas; M.R.C.S., L.R.C.P., D.P.H., *Ashman's Hall, Barsham.*

2288 1907. July. MORTON, J. Stevenson, D.P.H. CAMB., *Nelson Place, Newcastle, Staffs.*

2282 1907. July. PERCIVAL, Walter, *Assistant Borough Surveyor, Longton, Staffs.*

2286 1907. July. *M* SMITH, Charles Secker, M.R.C.V.S., *Veterinary Inspector, Barnsley.*

2283 1907. July. ‡SWINSON, Edward Thomas, *Balgownie, Hanworth Road, Feltham.*

2287 1907. July. *TWEEDIE, Frederick Charles, 2, *Spence St., Edinburgh.*

ASSOCIATES.

‡ Marked thus have passed the Examination for Inspectors of Nuisances.
§ Marked thus have passed the Examination of the Institute in Hygiene in its bearing on School Life.

4187 1907. July. ‡BAMFORTH, Frank, 11, *Station Road, Slaithwaite, Yorkshire.*
4188 1907. July. ‡BARLOW, Archibald Hughes, 12, *Heath Rd., Leighton Buzzard, Beds.*
4189 1907. July. ‡BATES, George, 29, *South Grove, Brooklands, Cheshire.*
4190 1907. July. ‡BRITTER, Amyas, *Town Hall, Woolwich.*
4191 1907. July. ‡BUSHELL, Frederick Howard, *Linton House, Station Road, Sheringham, Norfolk.*
4192 1907. July. ‡BUTTERS, Joseph B., 271, *Stockport Rd., Levenshulme.*
4193 1907. July. ‡CANHAM, Garfield Ewart, 13, *Pembroke Road, Norwich.*
4194 1907. July. ‡COLLIDGE, Alexander, *Leicester Road, Hinckley, Leicester.*
4195 1907. July. §DAKIN, Bertram Alexander, 14, *Westfield Terrace, Mytholmroyd, Yorkshire.*
4196 1907. July. §DRIESELMAN, Miss Muriel Dorothy, 167, *Stanstead Road, Forest Hill, S.E.*
4197 1907. July. ‡FIRTH, Charles, 3, *Burdale Place, Bradford.*
4198 1907. July. ‡GIBSON, Miss Lucy Marian, 45, *Shakespeare Street, Manchester.*
4199 1907. July. §GREENWOOD, Thomas Fenton, *Cliffe Road, Hebdon Bridge, Yorkshire.*
4200 1907. July. ‡GREENWOOD, William Edward, 5, *Culvert Street, Blackburn.*
4201 1907. July. ‡GLOVER, John Henry, 369, *Hulton Lane, Bolton.*
4202 1907. July. §HALL, Miss Margaret Ann, 138, *Weaver St., Winsford, Chester.*
4203 1907. July. ‡LAWRENCE, William, 61, *Heron Road, Herne Hill, S.E.*
4204 1907. July. ‡HARDING, Miss Orlo Susannah, 76, *South End, Croydon.*
4205 1907. July. §HUGHES, Mrs. Clara, 17, *Pawson Street, Morley, Yorkshire.*
4206 1907. July. ‡HUMPHREYS, Herbert George, 3, *Victoria Street, Maidstone.*
4207 1907. July. ‡IRELAND, Wilfred, 18, *Buchfield Road, Appleton, Widnes, Lancs.*
4208 1907. July. ‡LLOYD, Stanley Clement, *Gallybird, Barcombe, Lewes, Sussex.*
4209 1907. July. ‡MINHINNICK, John Thomas, 36, *Beaumont Road, Newton Abbot, Devon.*
4210 1907. July. ‡OAKES, Frederick Harold, *Clifton Cottage, Whaley Bridge, near Stockport.*
4211 1907. July. ‡PHELPS, George, 38, *Park Parade, Harlesden, N.W.*
4212 1907. July. ‡POLLARD, Herbert E., 15, *Nicholl Street, Duke Bar, Burnley.*
4213 1907. July. §POOLE, Miss Ada, *Belmont, Darton, near Barnsley.*

4186 1907. July. QUIRK, Edward, 17, *Ash Leigh, Liverpool.*
4214 1907. July. ‡ROBERTS, Joseph, *London Road, Chesterton, Staffs.*
4215 1907. July. §ROBERTS, Miss Ruth Amanda, 10, *Hope Street, Barnsley.*
4216 1907. July. ‡SENIOR, Qr. Master Sergt. Edward Hartley, *Milbank Barracks, S.W.*
4217 1907. July. ‡SKELTON, Phillips Brown, *Denver House, Clarence Road, Norwich.*
4218 1907. July. ‡THORROLD, John Favell, *North Ormsby, Middlesbro'.*
4219 1907. July. ‡TRIGGS, George Henry, *Town Hall, Woolwich.*
4220 1907. July. §TURNER, Miss Clarice, 2, *Doncaster Rd., Barnsley.*
4221 1907. July. ‡VOSPER, Miss Lavinia, *c/o Mrs. Thrights*, 24, *Riverside Road, Norwich.*
4222 1907. July. ‡WEBSTER, James, 14, *King's Road, Dundee.*
4223 1907. July. ‡WILLIAMS, William Henry, 170, *Brynland Avenue, Bishopston, Bristol.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY*

DURING JUNE, 1907.

*** *For publications of Societies and Institutions, etc., see under "Academies."*

ACADEMIES (BRITISH).

London. *Architects' Benevolent Society.* Annual Report for 1906. 53 pp., 8vo. London, 1907. *The Association.*

——— *Institution of Mechanical Engineers.* Proceedings, October—December, 1906. 360 pp., 8vo. London, 1907. *The Institution.*

——— *Surveyors' Institution.* Transactions, Vol. XXXIX., Part XII. 98 pp., 8vo. London, 1907. *The Institution.*

——— *Civil and Mechanical Engineers' Society.* Transactions, 1906–7. 153 pp., 8vo. London, 1907. *The Society.*

——— *Women Sanitary Inspectors' Association.* Annual Report, 1906–7, 14 pp. London, 1907. *The Association.*

Channel Tunnel. Reports by British and French Engineers, and Papers on National Defence by Gen. Sir Wm. Butler, G.C.B., Maj.-Gen. Sir A. E. Turner, K.C.B., and Vice-Admiral Sir C. Campbell, K.C.M.G. 56 pp., 4to. London, 1907. *Channel Tunnel Co.*

Greenwich. Magnetical and Meteorological Observations, 1905. 127 pp., 4to. Edinburgh, 1906. *The Astronomer Royal.*

Hanna, *W., M.B., D.P.H.* Anthrax and Imported Animal Products. 21 pp., 8vo. Bristol, 1907. *The Author.*

Industrial Diseases. Report of the Departmental Committee on Compensation for:— 24 pp., Fcp. London, 1907. *Purchased.*

Local Government Board. Dr. E. P. Manby's Report upon the Sanitary Circumstances and Administration of the Brentford Urban District. 10 pp., Fcp. London, 1907.

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* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

Local Government Board. Dr. L. W. Darra Mair's Report on the Sanitary Circumstances of the Whickham Urban District, with special reference to its Housing Accommodation generally, and to certain Back-to-back Houses at Marley Hill in particular. 26 pp., Fcp. London, 1907.
W. H. Power, C.B., F.R.S.

——— **Board of Education, Home Office, Treasury.** Departmental Decisions by the. Quarterly issue No. 7, June, 1907. 80 pp., 8vo. London, 1907.
S. E. Rogers (publisher).

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Blackburn Education Committee, 1906	*A. Greenwood, M.D., D.P.H.*
Cardiff, 1906..	*E. Walford, M.D., D.P.H.*
Carnarvonshire, 1906	*P. Fraser, M.D., B.Sc.*
Greenwich, 1906	*E. G. Annis, M.R.C.S., D.P.H.*
Hackney, 1906	*J. King Warry, M.D., M.R.C.P.*
Huddersfield, 1st quarter, 1907 ..	*S. G. Moore, M.D., D.P.H.*
Hunslet R.D.C., 1906	*J. Buck, L.R.C.S., M.O.H.*
Kensington, 1906	*T. Orme Dudfield, M.D.*
London, Four weeks ending 13th April, 1907	*W. Collingridge, M.D., D.P.H.*
Newcastle-on-Tyne, 1906	*H. E. Armstrong, D.Hy.*
Paddington, 1906	*R. Dudfield, M.B., D.P.H.*
Scarborough, 1906	*J. Knight, M.D., D.P.H.*

Shaw, *W. N., F.R.S.* Air Currents and the Laws of Ventilation. 104 pp., 8vo. Cambridge, 1907. *The Author.*

Whipple, *G. C.* The Value of Pure Water. 92 pp., 8vo. London and New York, 1907. *J. Wiley & Sons (publishers).*

NEW PREMISES FUND.

	£	s.	d.
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Cash received in Donations, etc., 1899–1906 ...	1,338	19	0
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Promises of Donations to the Douglas Galton Gallery	110	10	0
Contributions, 1907, already reported	11	0	0
E. B. Kershaw	0	10	6
E. Swainston (2nd Donation)	0	5	0

July 25th, 1907.

THE ROYAL SANITARY INSTITUTE.

SCHOOL HYGIENE CONGRESS AND EXHIBITION.

The Second International Congress on School Hygiene was held in London in the first week of August. The subject is one in which the Institute has taken a great interest, and a full account of the meeting will be given in a subsequent number of the JOURNAL.

In connection with the Congress the Institute arranged an Exhibition to illustrate, as far as possible, the wide scope of the subject, and the following classification of Exhibits was adopted:—Drawings and Designs; Building Materials and Construction; Floor and Wall Surfaces; Water Supply; Drainage, Sanitary Appliances and Fittings; Warming, Lighting, and Ventilation; Decoration; Dietaries; Clothing; Furnishing and Equipment; Teaching and Technical Appliances; Physical Culture; Playgrounds.

The Exhibition was arranged in the Great Hall, East and West Galleries, and the Quadrangle of the University of London, and most of the Congress Meetings were held in rooms in the same building. The Catalogue issued by the Institute gives a full list of the Exhibits, and a list of the Awards made by the Judges is published in this Journal.

Some reference should be made to the Loan Collection, which occupied a large portion of the Exhibition, the Exhibits in this section not being open to consideration for Award.

Loan Exhibits illustrative of school work in the several countries were sent from Austria, Denmark, France, Germany, Holland, Italy, Spain, Sweden, and Switzerland, in most cases being collected by the Government or Municipality, or by the local Committee of the Congress in the town or country represented.

The French Section, which consisted of views and photographs of the schools and children at their work, and specimens of the work done by the children themselves, was systematically and carefully arranged by Dr. Friedel, who came over from Paris and devoted many days to the work.

The German Section was made up of exhibits collected and sent over by the Berlin Rixdorf State Museum for School Hygiene, Cologne Town Council, the Local Committee for Upper Bavaria, the Royal City Council of Dresden, and the Town Councils of Müllhausen and Strasbourg.

Many of the exhibits from other countries included illustrations of various forms of manual occupations as an important part of the curriculum of the schools, but unfortunately these occupations appeared to be only provided for boys, and the handwork for girls confined to needlework and drawing.

In the British and Colonial Section a comprehensive exhibit was arranged by the London County Council, including a preliminary attempt

to indicate methods of training teachers and children in hygiene, with diagrams showing details of ringworm, for the purpose of pressing the importance of its prevention on teachers, and as giving an illustration of the observations made in the medical supervision of schools, and the precautions taken with regard to infectious diseases.

Plans and elevations of various forms of schools erected by the London County Council were also shown.

The Committee for Scotland sent a number of exhibits illustrative of the physical training adopted in their schools, and the training adopted for the teachers.

Several other schools and societies throughout the kingdom were represented, and in the grounds a boys' holiday camp and tent were erected, a special feature of the tent being the ample ventilation provided, and the means of easy supervision from the outside.

LIST OF AWARDS.

SILVER MEDALS.

British Sanitary Co.—Earth Closet.

Wm. Cassels.—"Clarifont" Wash Basin.

Chaddock Mechanical Window Co.—Chaddock Window Fittings.

Christoph & Unmack.—School Pavilion.

Duckett & Sons.—Improved Overflow Lavatory.

John Knight & Sons.—Combined Stoneware and Cast-iron Drain Fittings.

Spencer, Heath, & George, Ltd.—Educational Gymnastic Outfits.

BRONZE MEDALS.

Michl. Alajos.—Changeable School Benches.

E. J. Arnold.—The Florence Kirk Colour Educational Appliances.

E. J. Arnold.—Hygienic Educational Diagrams.

Bratt, Colbran, & Co.—Heaped Fireplace in Glazed Earthenware.

British Challenge Glazing Co., Ltd.—Lead-covered Steel Glazing Bar.

Candy & Co., Ltd.—Glazed Faience "Devon" Fireplaces.

Wm. Cassels.—Towel Distributor.

Combination Collapsible Ventilator Co.—Collapsible Hopper.

J. Duckett & Sons, Ltd.—"Kingston" Corbet Closet, with radial joint.

J. Duckett & Sons, Ltd.—Slab Urinals, with rounded internal corners.

J. Duckett & Sons, Ltd.—"Solent" School Urinal Range for three persons.

Educational Supply Association, Ltd.—Adjustable Desks.

Educational Supply Association, Ltd.—"Farringdon" Adjustable Desk.

"England" Works, Leeds.—Steel self-contained Cloakroom Fittings.

Fletcher, Russell, & Co., Ltd.—Laboratory and Workshop Appliances for use with gas.

HASSERODT & Co.—Stumpf Reform Sash Window.
JEYES SANITARY COMPOUND Co., LTD.—"Cyllin," coefficient 20·0.
JOHN JONES, LTD.—Single School Urinal and Automatic Flushing Cistern.
JOHN JONES, LTD.—The Gravitation System of Water Supply to Closets.
JOHN JONES, LTD.—Pedal Spray Lavatory.
LEEDS FIRECLAY Co., LTD.—"Infanta" Closet for girls.
LEEDS FIRECLAY Co., LTD.—"Taper" Type Urinal.
LIMMER ASPHALTE PAVING Co.—Lithofalt.
JOSEPH W. LOVIBOND.—Systematised Colour Instruction and Materials for Teaching Young Children.
MAGAZINE HOLDER Co.—The "Scholars" Simplex Stand for fixing to any make of desk.
C. C. MEINHOLD & SONS.—Anatomical and Physiological Wall Diagrams.
MERRITT & Co.—Metal Lockers.
P. JOHANNES MUELLER.—Dual Desk, hinged for floor cleaning.
NEWTON CHAMBERS & Co., LTD.—"Izal," coefficient 13·0.
A. E. PODMORE.—Dust-proof Bunsen Burner Intensifying Lamp.
PRYKE & PALMER.—Eaves Gutter, with fillets cast on back.
PRYKE & PALMER.—Steel Enamelled Bath, on a wheeled cradle.
SANITAS Co., LTD.—"Sanitas Okol," coefficient 20–22.
SCHOOL FURNITURE MANUFACTORY.—Adjustable Desk for girls, with movable table for needlework.
T. J. SYER.—Pupil-Mechanic's Fitting Bench, with parallel vice.
F. E. WACHSMUTH.—First Aid Diagrams.

DEFERRED FOR FURTHER CONSIDERATION.

BRITISH DOLOMENT Co., LTD.—Patent Jointless Flooring.
JOHN JONES, LTD.—Air-testing Apparatus.
JOHN JONES, LTD.—Anti-flooding Trap.
OZONAIR, LTD.—Ozone Ventilating Appliances.

FORTHCOMING MEETINGS.

LECTURES TO SANITARY OFFICERS.

The Forty-fourth Course of Lectures and Demonstrations to Sanitary Officers will commence on Monday, September 16th. The Lectures are arranged to include the subjects scheduled for the examination for Inspector of Nuisances held by The Royal Sanitary Institute and the Sanitary Inspectors Examination Board (formed by The Sanitary Institute and other bodies).

Lectures on Sanitary Science as applied to Buildings and Public Works.

A Course of Lectures has been arranged to assist those desiring instruction in Sanitary Science as applied to Buildings and Public Works, suitable to Foremen of Works, Builders, and those engaged in Allied Trades, Managers of Property, Teachers and Lecturers, and others who are desirous of obtaining the Certificate of the Institute in Sanitary Science as applied to Buildings and Public Works.

Inspections and Demonstrations are arranged, and include visits to Disinfecting Stations, Municipal Depots, Artizans' Dwellings, Water-works, Sanitary Works in Progress, Refuse and Sewage Disposal Works, etc., etc., and other Public and Private Works illustrative of Sanitary Practice and Administration.

The Course will commence on September 21st.

Course of Lectures on Hygiene in its bearing on School Life.

This Course of Lectures has been arranged to assist Teachers and others interested in the training of children and the structural conditions of the school, who purpose entering for the Examination of the Institute in Hygiene in its bearing on School Life.

The Fourth Course will commence on September 30th.

Course of Practical Training for Meat Inspectors

for candidates preparing for the Examination for Inspectors of Meat and Other Foods, conducted by The Royal Sanitary Institute.

The Ninth Course will commence on October 4th, and will consist of systematic Practical Training in the Inspection of Meat at a Cattle Market, including Demonstration on live cattle and sheep, slaughtering and dressing of animals, names and situations of the organs, diseases of animals, methods of stalling, arrangements of markets and byres, etc.

Demonstration will also be arranged at a knacker's yard, where instruction regarding the flesh and organs of the horse will be given.

The Course will continue for two months.

Special Course on Food and Meat Inspection.

The Fifth Special Course of Practical Training in Food and Meat Inspection for Commissioned Officers and Professional Students preparing for the Examination for Inspectors of Meat and other Foods, conducted by The Royal Sanitary Institute, will commence on November 12th.

The dates and subjects of the Lectures and Demonstrations in each Course are given month by month in the Calendar.

Calendar, September and October, 1907.

As far as at present arranged.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

SEPTEMBER.

16 M. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, A: Introductory Remarks, Public Health Acts—English, Scotch, Irish; other Statutes relating to Public Health; By-laws (Model, etc.), Regulations, Orders, Memoranda, etc., by J. Priestley, B.A., M.D., M.R.C.S., D.P.H., M.O.H. Lambeth.

18 W. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, B: Public Health (London) Act; Metropolis Local Management Acts; By-laws and Regulations in force in the Administrative County of London, by J. Priestley, B.A., M.D., M.R.C.S., D.P.H.

20 F. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, C: Factory and Workshop Acts (including Bakehouse Legislation, 1878–95) as they affect the Sanitary Inspector; Smoke Legislation; Food and Drugs Acts, 1899, by J. Priestley, B.A., M.D., M.R.C.S., D.P.H.

21 S. Inspection and Demonstration of Wimbledon Sewage Works, at about 2.45 p.m. Conducted by C. H. Cooper, M.INST.C.E., Borough Engineer and Surveyor.

23 M. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General, A: Outdoor, by A. Wellesley Harris, M.R.C.S., D.P.H., M.O.H. Lewisham.

25 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt., Public Health Dept., Borough of Islington.

26 Th. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General B: Indoor, by A. Wellesley Harris, M.R.C.S., D.P.H.

27 F. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—C: Offensive Trades and Trade Nuisances, etc., by A. Wellesley Harris, M.R.C.S., D.P.H.

28 S. Inspection and Demonstration at the Southwark and Vauxhall Water Works, Hampton, at about 2.30 p.m.

30 M. Lecture to Sanitary Officers at 7 p.m. Infectious Diseases, by Prof. A. Bostoc Hill, M.D., D.P.H., F.I.C.

OCTOBER.

1 T. Lecture to School Teachers, at 7 p.m. "Physiology," by Prof. H. R. Kenwood, M.B., D.P.H.

1 T. Lecture to Sanitary Officers at 7 p.m. Methods of Disinfection, by Prof. A. Bostock Hill, M.D., D.P.H., F.I.C.

2 W. Inspection and Demonstration at John Knight & Sons' Soap Works, Silvertown, at 3 p.m.

2 W. Lecture to School Teachers, at 7 p.m. "Physiology," by Prof. H. R. Kenwood, M.B., D.P.H.

2 W. Lecture to Sanitary Officers at 7 p.m. "Elementary Statistics," by Prof. A. Bostock Hill, M.D., D.P.H., F.I.C.

3 Th. Demonstration of Book-keeping as carried out in a Sanitary Inspector's Office, at the Public Health Office, Town Hall, Upper St., Islington, N., at 7 p.m., by James R. Leggatt, Supt. Public Health Dept., Borough of Islington.

4 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

4 F. Lecture to School Teachers, at 7 p.m. "Physiology," by Prof. H. R. Kenwood, M.B., D.P.H.

4 F. Lecture to Sanitary Officers at 7 p.m. "Elementary Science: Physics, Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

4 F. } 5 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Derby.

5 S. Demonstration—Meat Inspectors' Course, at 2 p.m.

5 S. Inspection and Demonstration at the Sewage and Destructor Works, Ealing, at 2.15 p.m. Conducted by Charles Jones, M.INST.C.E., Borough Engineer and Surveyor.

7 M. Demonstration on Meteorological Instruments in the Parkes Museum, at 6 p.m., by the Director, E. White Wallis, F.S.S.

7 M. Lecture to School Teachers, at 7 p.m. "Food and Clothing," by Col. J. Lane Notter, R.A.M.C, M.A., M.D., D.P.H.

7 M. Lecture to Sanitary Officers at 7 p.m. "Elementary Science: Physics, Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

9 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt., Public Health Dept., Borough of Islington.

9 W. Lecture—Sanitary Science Course, at 7 p.m. "Science, Physics, Chemistry, and Meteorology," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

10 Th. Demonstration on Building Materials and Construction in the Parkes Museum, at 6 p.m.

10 Th. Lecture to Sanitary Officers at 7 p.m. "Elementary Science: Physics, Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

11 F. Lecture to Sanitary Officers at 7 p.m. "Elementary Science: Physics, Chemistry," by E. J. Steegmann, M.B., M.R.C.S, D.P.H.

11 F. } 12 S. } Examination for Inspectors of Meat and other Foods, Birmingham.

12 S. Inspection and Demonstration at the Aylesbury Dairy Company's premises, St. Petersburgh Place, Bayswater, W., at 2.30 p.m.

14 M. Demonstration on Baths and Lavatories in the Parkes Museum, at 6 p.m.

14 M. Lecture to School Teachers, at 7 p.m., "School Buildings, Water Supply, etc.," by J. Osborne Smith, F.R.I.B.A.

14 M. Lecture to Sanitary Officers at 7 p.m. "Calculations, Measurements, and Plans and Sections," by W. C. Tyndale, M.INST.C.E.

16 W. Inspection and Demonstration at a Factory Building, at 3 p.m. Conducted by H. D. Searles Wood, F.R.I.B.A.

16 W. Demonstration on Waste Preventers and Water Closets in the Parkes Museum, at 6 p.m.

16 W. Lecture to School Teachers at 7 p.m. "School Furniture," by Prof. H. R. Kenwood, M.B., D.P.H.

16 W. Lecture to Sanitary Officers at 7 p.m. "Building Materials," by H. D. Searles Wood, F.R.I.B.A.

18 F. Demonstration on Pipe Joints, etc., and Drain Testing Appliances, in the Parkes Museum, at 6 p.m.

18 F. Lecture to School Teachers at 7 p.m. "Physical Exercises," by P. Boobbyer, M.D
18 F. Lecture to Sanitary Officers at 7 p.m. "Sanitary Building Construction and Planning: Soil and Local Physical Conditions," by H. D. Searles Wood, F.R.I.B.A.
19 S. Demonstration--Meat Inspectors' Course, at 2 p.m.
19 S. Inspection and Demonstration at the Lambeth Disinfecting Station, at 2.30 p.m. Conducted by J. Priestley, M.D., D.P.H., M.O.H., Lambeth.
21 M. Demonstration on House Drainage in the Parkes Museum, at 6 p.m.
21 M Lecture to Sanitary Officers at 7 p.m. "Sanitary Appliances," by W. C. Tyndale, M.INST.C.E.
22 T. Lecture—Sanitary Science Course, at 7 p.m. "Sanitary Building Construction" (Advanced), by H. D. Searles Wood, F.R.I.B.A.
23 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt. Public Health Department, Borough of Islington.
23 W. Demonstration on Water Supply in the Parkes Museum, at 6 p.m.
23 W. Lecture to Sanitary Officers at 7 p.m. "Details of Plumbers' Work," by J. Wright Clarke.
25 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.
25 F. Lecture to Sanitary Officers at 7 p.m. "Ventilation, Warming, and Lighting," by J. Osborne Smith, F.R.I.B.A.
25 F. } 26 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Liverpool.
26 S. Inspection and Demonstration at the Camberwell Infirmary, Brunswick Square, Peckham Road, S.E., at 2.15 p.m. Conducted by Edwin T. Hall, V-P.R.I.B A.
28 M. Lecture to Sanitary Officers at 7 p.m. "House Drainage," by W. C. Tyndale, M.INST.C.E.
30 W. Inspection and Demonstration at L.C.C. Municipal Lodging House, Kemble Street, Drury Lane. W.C., at 3 p.m.
30 W. Lecture to School Teachers at 7 p.m. "Physical Conditions," by James Kerr, M.A., M.D., D.P.H.
31 Th. Lecture to Sanitary Officers at 7 p.m. "Water: Composition, Pollution, and Purification," by A. Wellesley Harris, M.R.C.S., D.P.H.

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.*

DURING AUGUST, 1907.

*** *For publications of Societies and Institutions, etc., see under "Academies."*

Board of Agriculture and Fisheries. Agricultural Statistics, 1906. Vol. XLI., Part III. Prices and Supplies of Corn, Live Stock, and other Agricultural Produce. 333 pp., 8vo. London, 1907. *The Board.*

Dibdin, *W. J., F.I.C., F.C.S.* Recent Improvements in Methods for the Biological Treatment of Sewage, with a description of the Author's Multiple Surface Biological Beds (Patent No. 16851, 1903) for effectually dealing with Suspended Matters with Aërobic Action throughout. 68 pp., 8vo. London, 1907. *The Sanitary Publishing Co.*

*Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

Factories and Workshops. Second Report of the Departmental Committee appointed to inquire into the Ventilation of Factories and Workshops. Part I., Report. 12 pp., fcap. London, 1907.

——— Second Report of the Departmental Committee appointed to inquire into the Ventilation of Factories and Workshops. Part II., Appendix. 63 pp. (plates), fcap. London, 1907. *The Chief Inspector of Factories.*

Local Government Board. Dr. J. Spencer Low's Report upon the Sanitary Circumstances and Administration of the Three Sanitary Districts within the Thetford Registration District. No. 269. 20 pp., fcap. London, 1907.

——— Dr. Reginald Farrar's Report on the accommodation of Navvies engaged in the construction of the Brooklands Racing Track, near Weybridge, with some suggestions relating to Constructional Works in general. No. 272. 7 pp., fcap. London, 1907. *W. H. Power, C.B., F.R.S.*

MEDICAL OFFICERS OF HEALTH & OTHER SANITARY REPORTS.

Battersea (Public Health Dept.), 1906 *I. Young, Chief Sanitary Inspector.*

Bradford, 1906 .. .. .. *W. Arnold Evans, M.D., B.Sc.*

Gloucestershire C.C., 1906 .. .. *J. Middleton Martin, M.D., D.P.H.*

Hertfordshire C.C., 1906 .. .. *F. E. Fremantle, M.B., D.P.H.*

Liverpool, 1906 .. .. .. *E. W. Hope, M.D., D.Sc.*

Lowestoft, 1906 .. .. .. *A. Marshall, M.D., D.P.H.*

Middlesex C.C., 1906 .. .. *C. W. F. Young, M.D., D.P.H.*

Nottinghamshire C.C., 1906 .. *H. Handford, M.D., F.R.C.P., D.P.H.*

Preston, 1906 .. .. .. *H. O. Pilkington, M.R.C.S.*

Salford, 1906 .. .. .. *C. H. Tattersall, M.R.C.S.*

Wiltshire C.C., 1906 .. .. *J. Tubb-Thomas, M.D., D.P.H.*

Woolwich, 1906 .. .. .. *S. Davies, M.D., D.P.H.*

Stephenson, *S., M.B., C.M.* Ophthalmia Neonatorum, with especial reference to its causation and prevention. 246 pp., 8vo. London, 1907. *The Publishers (Geo. Pulman & Sons, Ltd.)*

Transvaal. Second Annual Report of the Rand Water Board to the Colonial Secretary of the Transvaal. 49 pp., fcap. Johannesburg, 1907. *D. Leitch, M.Inst.C.E., Chief Engineer.*

THE ROYAL SANITARY INSTITUTE.

ARTICLES RELATING TO PUBLIC HEALTH,*

Appearing in the chief British and Foreign Journals and Transactions.

Abstracts of Titles classified in this List under the following headings:—

Science in Relation to Hygiene and Preventive Medicine.
Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.
Building Materials, Construction, and Machinery.
Water Supply, Sewerage, and Refuse Disposal.
Heating, Lighting, and Ventilating.
Personal and Domestic Hygiene.

The articles referred to in this list are as far as possible collected and filed in the Library of the Institute for the use of the Members and Associates.

Science in relation to Hygiene and Preventive Medicine.

BARR, SIR JAMES, M.D., F.R.S.ED. Preventive Medicine, the Medicine of the Future. *Journal of the Royal Institute of Public Health*, Sept., 1907, p. 513.

Embraced by title.

GLAISTER, PROF. JOHN, M.D., F.R.S.ED. Address upon Child Study and School Hygiene. *Journal of the Royal Institute of Public Health*, Sept., 1907, p. 547.

Delivered at recent Congress at Douglas.

WOLSTENHOLME, J. B., F.R.C.V.S. Address to the Veterinary Hygiene Section at the recent Congress at Douglas. *Journal of the Royal Institute of Public Health*, Sept., 1907, p. 555.

Deals with meat inspection.

WOODHEAD, PROF. G. SIMS, M.A., M.D. Anti-bodies. *Journal of the Royal Institute of Public Health*, Sept., 1907, p. 535.

A clear and interesting statement upon "anti-toxines" contained in Inaugural Address delivered at the recent Congress at Douglas.

Water Supply, Sewerage, and Refuse Disposal.

CALMETTE, A. The Mechanism of Biological Purification by Contact and Percolating Beds. *Revue d'Hygiène*, June, 1907, p. 496.

Describes the parts which physical, chemical, and biological actions play in the purification which takes place in contact beds and percolating filters.

"ENGINEERING RECORD." Notes on Water Purification at St. Louis. July 27th, 1907, p. 98.

Description of twelve months' work in purifying turbid waters.

* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

"ENGINEERING RECORD." The New Water Supply of Mexico. Aug. 3rd, 1907, p. 128.

Description of the new water supply for Mexico City drawn from four groups of large springs. The city lies in a great basin 7,000 ft. above sea-level, and surrounded by high mountains.

KIMBERLY, A. ELLIOTT. The Use and the Abuse of Sewage Purification Plants. *Engineering Record*, Aug. 31st, 1907, p. 234.

Problem of sewage purification—Ohio sewage plants—general efficiency of Ohio Plants—neglect of sewage plants.

THRESH, JOHN C., M.D., D.Sc. The Detection of Pollution in Underground Waters. *Engineering Record*, Sept. 7th, 1907, p. 267.

Description of methods of detection that may be employed for ascertaining the course of underground waters, with reference to their liability to become polluted.

Personal and Domestic Hygiene.

ALEXANDER, Dr. F. W. Annual Report of M.O.H. for Poplar, 1906.

Contains a description of the plant for the manufacture of Electrolytic Disinfectant for municipal and domestic use, as carried on by the Borough Council, together with the cost of working the same.

FORTHCOMING MEETINGS.

London, October 16th, at 8.30 p.m. Adjourned discussion on "Suggested Amendments to the L.C.C. By-Laws as to Drainage," opened by Louis C. Parkes, M.D., D.P.H., J. Patten Barber, M.Inst.C.E., and Isaac Young, on May 29th, and reported in the Journal at page 225.

Ipswich, October 19th, at 11 a.m. Discussion on "The Recent Report of the Royal Commission on Tuberculosis," by A. M. N. Pringle, M.B., C.M., D.P.H., Medical Officer of Health.

EXAMINATIONS.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and
In Hygiene in its Bearing on School Life.

Derby, October 4th and 5th.
Liverpool, ,, 25th and 26th.
Inverness, November 1st and 2nd.
Bristol, ,, 8th and 9th.
Newcastle, ,, 15th and 16th.
Manchester, ,, 29th and 30th.

Inspectors of Meat and Other Foods.

Birmingham, October 11th and 12th.
Bristol, November 22nd and 23rd.

Calendar, October and November, 1907.

As far as at present arranged.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

The Parkes Museum is open free, on Mondays 9.30 a.m. to 8 p.m., other days 9.30 a.m. to 5.30 p.m. The Library and Office are closed at 1 p.m. on Saturdays.

OCTOBER.

1 T. Lecture to School Teachers, at 7 p.m. "Physiology," by Prof. H. R. Kenwood, M.B., D.P.H.

1 T. Lecture to Sanitary Officers at 7 p.m. Methods of Disinfection, by Prof. A. Bostock Hill, M.D., D.P.H., F.I.C.

2 W. Inspection and Demonstration at John Knight & Sons' Soap Works, Silvertown, at 3 p.m.

2 W. Lecture to School Teachers, at 7 p.m. "Physiology," by Prof. H. R. Kenwood, M.B., D.P.H.

2 W. Lecture to Sanitary Officers at 7 p.m. "Elementary Statistics," by Prof. A. Bostock Hill, M.D., D.P.H., F.I.C.

3 Th. Demonstration of Book-keeping as carried out in a Sanitary Inspector's Office, at the Public Health Office, Town Hall, Upper St., Islington, N., at 6 p.m., by James R. Leggatt, Supt. Public Health Dept., Borough of Islington.

4 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

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4 F. Lecture to Sanitary Officers at 7 p.m. "Elementary Science: Physics, Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

4 F. } 5 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Derby.

5 S. Demonstration—Meat Inspectors' Course, at 2 p.m.

5 S. Inspection and Demonstration at the Sewage and Destructor Works, Ealing, at 2.15 p.m. Conducted by Charles Jones, M.INST.C.E., Borough Engineer and Surveyor.

7 M. Demonstration on Meteorological Instruments in the Parkes Museum, at 6 p.m., by the Director, E. White Wallis, F.S.S.

7 M. Lecture to School Teachers, at 7 p.m. "Food and Clothing," by Col. J. Lane Notter, R.A.M.C, M.A., M.D., D.P.H.

7 M. Lecture to Sanitary Officers at 7 p.m. "Elementary Science: Physics, Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

9 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt., Public Health Dept., Borough of Islington.

9 W. Lecture—Sanitary Science Course, at 7 p.m. "Science, Physics, Chemistry, and Meteorology," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

10 Th. Demonstration on Building Materials and Construction in the Parkes Museum, at 6 p.m.

10 Th. Lecture to Sanitary Officers at 7 p.m. "Elementary Science: Physics, Chemistry," by E. J. Steegmann, M.B., M.R.C.S., D.P.H.

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11 F. } 12 S. } Examination for Inspectors of Meat and other Foods, Birmingham.

12 S. Inspection and Demonstration at the Aylesbury Dairy Company's premises, St. Petersburgh Place, Bayswater, W., at 2.30 p.m.

14 M. Demonstration on Baths and Lavatories in the Parkes Museum, at 6 p.m.

14 M. Lecture to School Teachers, at 7 p.m., "School Buildings, Water Supply, etc.," by J. Osborne Smith, F.R.I.B.A.

14 M. Lecture to Sanitary Officers at 7 p.m. "Calculations, Measurements, and Plans and Sections," by W. C. Tyndale, M.INST.C.E.

16 W. Inspection and Demonstration at a Factory Building, at 3 p.m. Conducted by H. D. Searles Wood, F.R.I.B.A.

16 W. Demonstration on Waste Preventers and Water Closets in the Parkes Museum, at 6 p.m.

16 W. Lecture to School Teachers at 7 p.m. "School Furniture," by Prof. H. R. Kenwood, M.B., D.P.H.

16 W. Lecture to Sanitary Officers at 7 p.m. "Building Materials," by H. D. Searles Wood, F.R.I.B.A.

16 W. **Sessional Meeting,** LONDON, at 8.30 p.m. Adjourned Discussion on "Suggested Amendments to the L.C.C. By-Laws as to Drainage," by Louis C. Parkes, M.D., D.P.H., J. Patten Barber, M.INST.C.E., and Isaac Young, on May 29th.

18 F. Demonstration on Pipe Joints, etc., and Drain Testing Appliances, in the Parkes Museum, at 6 p.m.

18 F. Lecture to Sanitary Officers at 7 p.m. "Sanitary Building Construction and Planning: Soil and Local Physical Conditions," by H. D. Searles Wood, F.R.I.B.A.

19 S. **Sessional Meeting,** IPSWICH. Discussion on "The Recent Report of the Royal Commission on Tuberculosis," by A. M. N. Pringle, M.D., C.M., D.P.H., Medical Officer of Health.

19 S. Demonstration—Meat Inspectors' Course, at 2 p.m.

19 S. Inspection and Demonstration at the Lambeth Disinfecting Station, at 2.30 p.m. Conducted by J. Priestley, M.D., D.P.H., M.O.H., Lambeth.

21 M. Demonstration on House Drainage in the Parkes Museum, at 6 p.m.

21 M Lecture to Sanitary Officers at 7 p.m. "Sanitary Appliances," by W. C. Tyndale, M.INST.C.E.

22 T. Lecture—Sanitary Science Course, at 7 p.m. "Sanitary Building Construction" (Advanced), by H. D. Searles Wood, F.R.I.B.A.

23 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R. Leggatt, Supt. Public Health Department, Borough of Islington.

23 W. Demonstration on Water Supply in the Parkes Museum, at 6 p.m.

23 W. Lecture to Sanitary Officers at 7 p.m. "Details of Plumbers' Work," by J. Wright Clarke.

25 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

25 F. Lecture to Sanitary Officers at 7 p.m. "Ventilation, Warming, and Lighting," by J. Osborne Smith, F.R.I.B.A.

25 F. } 26 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Liverpool.

26 S. Inspection and Demonstration at the Camberwell Infirmary, Brunswick Square, Peckham Road, S.E., at 2.15 p.m. Conducted by Edwin T. Hall, V-P.R.I.B.A.

28 M. Lecture to Sanitary Officers at 7 p.m. "House Drainage," by W. C. Tyndale, M.INST.C.E.

30 W. Inspection and Demonstration at L.C.C. Municipal Lodging House, Kemble Street, Drury Lane, W.C., at 3 p.m.

30 W. Lecture to School Teachers at 7 p.m. "Physical Conditions," by James Kerr, M.A., M.D., D.P.H.

31 Th. Lecture to Sanitary Officers at 7 p.m. "Water: Composition, Pollution, and Purification," by A. Wellesley Harris, M.R.C.S., D.P.H.

NOVEMBER.

1 F. Lecture to School Teachers at 7 p.m. "Physical Conditions," by J. Kerr, M.A., M.D.

1 F. Lecture to Sanitary Officers at 7 p.m. "Water Supply, Sources of Supply, and Distribution," by J. E. Worth, M.INST.C.E.

1 F. } 2 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Inverness.

2 S. Demonstration—Meat Inspectors' Course, at 3 p.m.

2 S. Demonstration at the Marylebone Workhouse and Public Baths, at 3 p.m., conducted by A. Saxon Snell, F.R.I.B.A.

4 M. Lecture to School Teachers at 7 p.m. "Physical Exercises," by P. Boobbyer, M.D.

4 M. Lecture to Sanitary Officers at 7 p.m. "Sewerage," by J. E. Worth, M.INST.C.E.

6 W. Lecture to Sanitary Officers at 7 p.m. "Sewage Disposal," by J. E. Worth, M.INST.C.E.

8 F. Lecture—Meat Inspectors' Course at 6.30 p.m.

8 F. Lecture to Sanitary Officers at 7 p.m. "Scavenging, Disposal of House Refuse," by J. E. Worth, M.INST.C.E.

8 F. } 9 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Bristol.

11 M. Lecture to Sanitary Officers at 7 p.m. "Signs of Health and Disease in Animals destined for Food, when alive and after slaughter; Tuberculin and other Tests," by Major J. A. Meredith, F.R.C.V.S.

12 T. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on "Meat Inspection," by James King, M.R.C.V.S.

12 T. Demonstration—Meat Inspectors' Course, at 6.30 p.m., on Foods, other than Meat, by Col. J. Lane Notter, R.A.M.C.

13 W. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

13 W. Inspection and Demonstration at Harrison & Barber's Knackers' Yard, Winthrop Street, Whitechapel, E., at 3 p.m. Conducted by R. Glover, F.R.C.V.S., Veterinary Inspector, County Borough of West Ham.

13 W. Lecture to Sanitary Officers at 7 p.m. "The Names and Situations of the Organs of the Body in Animals," by Major J. A. Meredith, F.R.C.V.S.

14 Th. Inspection and Demonstration at the Metropolitan Cattle Market, York Road, N., at 2 p.m. Conducted by James King, M.R.C.V.S.

15 F. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on "Meat Inspection," by James King, M.R.C.V.S.

15 F. Lecture to Sanitary Officers at 7 p.m. "Practical Methods of Stalling and Slaughtering Animals," by Major J. A. Meredith, F.R.C.V.S.

15 F. } 16 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Newcastle.

16 S. Demonstration—Meat Inspectors' Course at 2 p.m.

16 S. Demonstration on Meat Inspection to Commissioned Officers and Professional Men at Metropolitan Cattle Market, at 3 p.m., by James King, M.R.C.V.S.

18 M. Lecture to Sanitary Officers at 7 p.m. "The Appearance and Character of Fresh Meat, Organs, Fat, Blood, Fish, Poultry, Milk, Fruit, Vegetables, and other food, and the conditions rendering them, or preparations of them, fit or unfit for human consumption. Preserving and Storing Meat and other foods," by E. Petronell Manby, B.A., M.D., D.P.H.

19 T. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

20 W. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

20 W. Lecture to Sanitary Officers at 7 p.m. The Hygiene of Byres, Lairs, Cowsheds. and Slaughterhouses, and all places where animals destined for the supply of food are kept, and the Hygiene of Markets, Dairies, and other places where food is stored, prepared, or exposed for sale, and transported, by E. Petronell Manby, B.A., M.D., D.P.H.

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.*

During July—September, 1907.

*** *For publications of Societies and Institutions, etc., see under "Academies."*

Allen, *J. K.* Swimming Pools. 63 pp., small 8vo. Chicago, 1907. *The Author.*

Bengal. Thirty-ninth Annual Report of the Sanitary Commissioner for the year 1906. *The Sanitary Commissioner.*

Berne. Resultats du recensement fédéral des entreprises agricoles, industrielles et commerciales, du 9 août, 1905. 357 pp., 4to. Berne, 1907.

——— Rapport du Bureau Fédéral des Assurances sur les Entreprises Privées en Matiére d'Assurances en Suisse en 1905. 184 pp., 4to. Berne, 1907.

——— Examen Pédagogique des Recrues en automne, 1906. 16 pp., 4to. Berne, 1907. *Bureau de Statistique.*

Brussels. Rapports des Commissions Médicales Provinciales sur leurs travaux pendant l'année, 1906. 1er fascicule. 539 pp., 8vo. Brussels, 1907. *Ministère de l'Agriculture.*

Cavanagh, *Francis, M.D.* The Care of the Body. 292 pp., 8vo. London, 1907. *Methuen & Co.*

Dibdin, *W. J., F.I.C., F.C.S.* Recent Improvements in Methods for the Biological Treatment of Sewage, with a description of the Author's Multiple Surface Biological Beds for effectually dealing with Suspended Matters. Second Edition. 68 pp., 8vo. London, 1907. *The Author.*

Donkin, *J., F.R.I.B.A.* Conservancy or Dry Sanitation *v.* Water Carriage. 33 pp., 8vo. London, 1906. *The Author.*

Douglas, *Carstairs, M.D., D.Sc., F.R.S.E.* The Laws of Health. A Handbook on School Hygiene. 240 pp., 8vo. London, 1907. *Blackie & Son, Ltd.*

Elkington, *J. S. C., M.D.* Health in the School, or Hygiene for Teachers. 192 pp., 8vo. London, 1907. *Blackie & Son, Ltd.*

Factories and Workshops. Annual Report of the Chief Inspector for the year 1906. 386 pp., fcp. London, 1907. *B. A. Whitelegge, C.B., M.D.*

——— Second Report of the Departmental Committee appointed to inquire into the Ventilation of. Part I.: Report. 12 pp., fcap. London, 1907. *Purchased.*

Geological Survey, *Memoirs of.* Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology, for 1906. 181 pp., 8vo. London, 1907. *Director, Geological Survey.*

Hamburg. Bericht des Medizinalrates über die Medizinische Statistik des, für das Jahr 1906. 102 pp., 4to. Hamburg, 1907.

Jensen, *C. O.* Essentials of Milk Hygiene, translated and amplified by Leonard Pearson. 275 pp., 8vo. Philadelphia, 1907. *J. B. Lippincott Company.*

Jensen, *G. J. G., C.E.* Modern Drainage, Inspection, and Sanitary Surveys. Second Edition. 131 pp., 8vo. London, 1907. *Sanitary Publishing Co.*

Local Government Board. Dr. W. W. E. Fletcher's Report upon the Sanitary Circumstances and Administration of the Brendon and Byshottles Urban District, with special reference to the prevalence of Enteric Fever. 28 pp., fcap. London, 1907.

——— Dr. Theodore Thomson's Report upon the Sanitary Circumstances and Administration of the Borough of Yeovil. 7 pp., fcap. London, 1907.

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*Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

Local Government Board. Dr. L. W. Darra Mair's Report upon the Sanitary Circumstances of the Whickham Urban District, with special reference to its Housing Accommodation generally, and to certain back-to-back houses at Marley Hill in particular. 26 pp., fcap. London, 1907.

——— Dr. E. P. Manby's Report upon the Sanitary Circumstances and Administration of the Brentford Urban District. 10 pp., fcap. London, 1907.

——— Dr. J. Spencer Low's Report upon the Sanitary Circumstances and Administration of the Denton Urban District. 9 pp., fcap. London, 1907.

——— Dr. J. Spencer Low's Report upon the Sanitary Circumstances and Administration of the Hurst Urban District. 7 pp., fcap. London, 1907.

——— Dr. J. Spencer Low's Report upon the Sanitary Circumstances and Adminstration of the Droylsden Urban District. 8 pp., fcap. London, 1907.

——— Dr. J. Spencer Low's Report upon the Sanitary Circumstances and Administration of the Lees Urban District. 7 pp., fcap. London, 1907.

——— Dr. W. W. E. Fletcher's Report upon the Sanitary Circumstances and Administration of the Borough of Mossley. 12 pp., fcap. London, 1907.

——— Dr. W. W. E. Fletcher's Report upon the Sanitary Circumstances and Administration of the Audenshaw Urban District. 9 pp., fcap. London, 1907.

——— Dr. J. Spencer Low's Report upon the Sanitary Circumstances and Administration of the Failsworth Urban District. 9 pp., fcap. London, 1907.

——— Dr. J. Spencer Low's Report upon the Sanitary Circumstances and Administration of the Limehurst Rural District. 7 pp., fcap. London, 1907.
W. H. Power, C.B., F.R.S.

London. Report of the Departmental Committee on Compensation for Industrial Diseases. 23 pp., fcap. London, 1907. *Purchased.*

——— Review of Internationalism. 110 pp., 8vo. London, 1907.
David Nutt (Publisher).

McMillan, *Margaret.* Labour and Childhood. 205 pp., 8vo. London, 1907.
The Author.

Massachusetts General Hospital. Selected Papers by the Staff, June, 1907. 250 pp., 8vo. Boston, 1907.

Maxwell, *W. H.. A.M.Inst.C.E.* Ventilation, Heating and Lighting,. Second Edition. 151 pp., 8vo. London, 1907. *Sanitary Publishing Co.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Bethnal Green, 1906 .. .. *G. P. Bate, M.D.*
Birkenhead, 1906 .. .. .. *R. Sydney Marsden, D.Sc., M.B., D.P.H.*
Birmingham, 1906 .. .. .. *J. Robertson, M.D., D.P.H.*
Bombay, 1906 .. .. .. *J. A. Turner, M.D., D.P.H.*
Bristol, 1906.. .. .. .. *D. S. Davies, M.D., D.P.H.*
Cheshire C.C., 1906 .. .. .. *F. Vacher, F.R.C.S.*
Derby, 1906 .. .. *W. J. Howarth, M.D., D.P.H.*
Dumbarton C.C., 1906 (Sanitary Inspector's Report).. .. .. *David Dunbar.*
Edinburgh, 1906, (Sanitary & Markets Departments) .. .. .. *A. Maxwell Williamson, M.D., B.Sc.*
Glamorgan C.C., 1906 .. .. *W. Williams, M.A., M.D., D.P.H.*
Highworth R.D.C., 1906 .. .. *F. E. Streeten, M.D., D.P.H.*
Huddersfield, 2nd quarter, 1907 .. *S. G. Moore, M.D., D.P.H.*
Lanark C.C., 1906 .. .. .. *J. T. Wilson, M.D., D.P.H.*
Lewisham, 1906 .. .. .. *A. Wellesley Harris, M.R.C.S., D.P.H.*

Liverpool, 1906	*E. W. Hope, M.D., D.Sc.*
London, Eight weeks ending 13th July, 1907	*W. Collingridge, M.D., D.P.H.*
Maidstone, 1906, Chief Sanitary Inspector's Report	*W. Jackling, A.R.San.I.*
Oldham, 1906	*J. B. Wilkinson, M.D., C.M., D.P.H.*
Poplar, 1906..	*T. W. Alexander, M.R.C.S., L.R.C.P., D.P.H.*
Punjab, 1906..	*Lieut.-Col. C. J. Bamber, I.M.S., D.P.H., Sanitary Commissioner.*
St. Helens, 1906	*J. J. Buchan, M.D., D.P.H.*
St. Pancras, Extract from 1906 Annual Report	*J. F. J. Sykes, D.Sc., M.D.*
Scarborough, 1906	*J. Knight, M.D., D.P.H.*
Stockport, 1906	*Meredith Young, M.D., D.P.H.*
Wolverhampton, 1906	*H. Malet, B.A., M.D., B.Ch.*
York, 1906	*E. M. Smith, M.D., C.M., D.P.H.*

Meyer, *H. Th., and* **Dollers,** *Georg.* Schulbauprogramm, nach dem Entwurfe des Schulbauten-Unsschuffes der Hamburgischen Schulfynode. 89 pp., 4to. Hamburg, 1904.

Michigan State Board of Health. Thirty-third Annual Report, for the Year ending June 30th, 1905. 214 pp., 8vo. *Lansing,* 1906. *The Board.*

New South Wales. Report of the Board of Health on Leprosy for the Year 1906. *J. Ashburton Thompson, M.D.*

Ontario. *Provincial Board of Health.* 25th Annual Report for the year 1906. 230 pp., 8vo. Toronto, 1907. *The Board.*

Punjab, Notes on Vaccination in the, for the Year 1906–7. By Lieut.-Col. C. J. Bamber, I.M.S., D.P.H. 14 pp., fcap. Lahore, 1907. *The Author.*

Registrar-General of Births, Deaths, and Marriages in England and Wales. 1891–1900. Part I. Supplement to the Sixty-fifth Annual Report. 964 pp., 8vo. London, 1907. *The Registrar-General.*

Reid, *George, M.D., D.P.H.* Nitrification of Sewage (reprinted from the Proceedings of the Royal Society, B., Vol. 79, 1907). 16 pp., 8vo. London, 1907. *The Author.*

Road Engineers and Road Users. Proceedings of Conference. Highways Improvement. Second Edition. Reprinted from the *Surveyor aad Municipal and County Engineer.* 60 pp., 4to.. London, 1907. *The Surveyor and Municipal and County Engineer.*

Saltet, *Dr. Med. R. H., and* **Falkenburg,** *Dr. Jur. Ph.* Statistische Mitteilungen veröffentlicht vom Statistischen Amt der Kindersterblichkeit Besonders in der Neiderlanden. 97 pp., 8vo. Amsterdam, 1907.

Scotch Education Department. Report by Dr. W. Leslie Mackenzie and Captain A. Foster on a collection of Statistics as to the Physical Condition of Children attending the Public Schools of the School Board for Glasgow. With relative Tables and Diagrams. 57 pp., fcap. London, 1907. *The Secretary.*

Smith, *E. M., M.D., D.P.H.* The Amendment of the Births and Deaths Registration Act. Reprinted from *Public Health,* June, 1907. 5 pp., 8vo. Bristol, 1907. *The Author.*

Transvaal. Report of the Commission on Contagious Diseases amongst Natives. 32 pp., fcap. Pretoria, 1907. *Charles Porter, M.D., D.P.H.*

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

THE CARE OF THE BODY.*

This is a well-written work dealing with personal hygiene. It is not a book designed to meet the needs of the medical reader, or even of the advanced public health student; it is essentially a popular exposition of the subject, and to that end scientific facts and sound advice are presented in a most readable manner. The lay public will find within its covers much to interest them, and much that they may learn and apply to their advantage.

The general dangers to personal health are nowadays the less obvious and more subtle ones, and the demands of personal hygiene, owing to the more artificial conditions of our existence, are even greater now than in former periods. As the author expresses it: "Man is no longer attacked by the foes of the calibre of the mastodon, the giant lizards, or sabre-toothed tigress; nor, except at infrequent intervals, is he now prone to be murdered either individually or on the large scale of war by his fellow-man; as his boundaries have widened his foes have shrunk, till in our day they have chiefly to be sought by the microscope."

H. R. K.

PRESERVATIVES IN FOOD AND FOOD EXAMINATION.†

This work is an 8vo of some 484 pages, well printed, and illustrated with 8 plates: it discusses the whole question of preservatives in food, giving detailed methods for their detection, and also summarises the existing literature as to food poisoning.

The evidence that the authors give of the injurious action of certain preservatives on health is convincing; for example, there are few things more firmly established by experiment than the deleterious action of sulphites on the kidneys; the summary given of these experiments will be useful to health officers and analysts.

The authors consider that benzoic acid is preferable to salicylic acid, and believe that it will be more generally employed in future. The reviewer has found benzoic acid in several well-known American sauces; but salicylic acid is the far more common preservative.

According to Thresh and Porter "There is apparently no evidence that salicylic acid employed as a preservative has ever produced any injurious effect." If by this is meant direct and obvious injury (in short, more or less acute poisoning), the assertion is true; and the same may be said of formalin, of borax, and of some others; on the other hand, the remarkable increase of intestinal affections (such as appendicitis) of late years, which has more or less coincided

* The Care of the Body, by Francis Cavanagh, M.D.Edin. 292 pp. London, 1907. Methuen & Co., 36, Essex Street, Strand, W.C. 7s. 6d. net.

† Preservatives in Food and Food Examination, by John C. Thresh, M.D.Vict., D.Sc. Lond., and Arthur E. Porter, M.D., M.A.Cantab. London, 1906. 14s. net.

with the general use of antiseptics in food, supports the general consensus of medical opinion that the digestive canal should not be irrigated with disinfectants, save with the consent and knowledge of the consumer. In other words, all manufacturers employing chemical substances to conserve their products should be obliged to legibly label the articles in such a way as to give sufficient information as to the nature and amount of the chemical added.

One of the most useful features of the work is the admirable summary of no less than 146 legal cases relating to adulterated and unwholesome food. There are two appendices, the one containing the conclusions to the report of the Departmental Committee, the other a brief summary of the law and practice in certain foreign countries and the colonies as to preservatives and colouring matter in food.

The book, considered as a whole, is a useful and reliable work of reference.

A. W. B.

THE BACTERIOLOGICAL EXAMINATION OF WATER SUPPLIES.*

Many of the data upon which the bacteriological examination of water is based, and the conclusions which these data warrant, have by no means passed beyond the region of controversy. There still remain many matters which only patient investigation can clear up; but it may be stated, without fear of contradiction, that at the present day our knowledge is enormously greater than it was even a few years ago. Under these circumstances, therefore, the present may be held to be a very suitable time for the appearance of a work which summarises the mass of data which have accumulated, and places before the reader reliable facts with reference to selected methods of procedure and the deductions which the results of these methods are *generally* held to justify. Dr. Savage's work admirably fulfils these functions. His complete and practical familiarity with his subject and its technique makes his summary of evidence from all sources of exceptional value, and it is one which is quite admirable in the judicial and scientific spirit which it displays.

I do not suppose that every bacteriologist will be prepared to endorse all the views expressed, and certainly, so far as methods are concerned, one in which the worker is specially practised will often prove a safer guide than a somewhat superior one with which he has to make himself laboriously familiar. But it may be said that there is now a general agreement that the three-test organisms for fæcal contamination of water are Bacilli Coli, Streptococcus, and Bacillus Enteritidis Sporogenes, and that the former are by far the most important.

Dr. Savage, while presenting a useful table of standards which may serve as a rough guide for practical purposes, is rightly averse to the adoption of any too definite or arbitrary standards for the interpretation of bacteriological results.

The part dealing with bacteriological technique is concise, clear and well illustrated, and a fairly full and up-to-date bibliography concludes a book which may be highly recommended to all those whose duty it is to keep conversant with the very important branch of public health work which has reference to the purity of our water supplies.

H. R. K.

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* The Bacteriological Examination of Water Supplies, by Dr. W. G. Savage, Medical Officer of Health and Public Analyst, Colchester; late Lecturer on Bacteriology, University College, Cardiff, etc. 297 pp., 8vo. London, H. K. Lewis. 6s. 6d. net.

LESSONS IN PRACTICAL HYGIENE FOR USE IN SCHOOLS.*

This talented and experienced authoress was among the first to appreciate the importance of educating the community (through the medium of school) in the simple laws necessary for healthy living.

Education authorities now recognise the importance of teaching hygiene in public elementary and other schools. To those who may be entrusted with this duty Miss Ravenhill's book is indispensable. From cover to cover one finds a wealth of material arranged simply and with intelligent care. Miss Ravenhill has a perfect grasp of her subject, and the work generally is deserving of high commendation. Its value is enhanced by the numberless simple experiments by which the subjects may be illustrated by teachers.

We heartily congratulate Miss Ravenhill upon the success she has achieved, and commend this book to both teacher and student. A. W. H.

ARTICLES RELATING TO PUBLIC HEALTH,†

Appearing in the chief British and Foreign Journals and Transactions.

Abstracts of Titles classified in this List under the following headings:—

Science in Relation to Hygiene and Preventive Medicine.
Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.
Building Materials, Construction, and Machinery.
Water Supply, Sewerage, and Refuse Disposal.
Heating, Lighting, and Ventilating.
Personal and Domestic Hygiene.

The articles referred to in this list are as far as possible collected and filed in the Library of the Institute for the use of the Members and Associates.

Science in relation to Hygiene and Preventive Medicine.

BUCHANAN, R. M., M.B., F.F.P.S.(Glasgow). The Carriage of Infection by Flies. *Lancet*, July 27th, 1907, p. 216.

Experiments are described which proved that flies could carry infection on their feet, and distribute it on the surfaces on which they walked.

CLARKE, HENRY H., M.A., M.B. On the Effect of Tuberculin on the General Tuberculo-Opronic Index in Tuberculous Patients. *Lancet*, July 20th, 1907, p. 158.

The scope of the paper is sufficiently indicated by the title.

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* Lessons in Practical Hygiene for use in Schools, by Alice Ravenhill, F.R.San.I. 744 pp., 8vo. Leeds, 1907. E. J. Arnold & Sons, Ltd. 5s. net.

† Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

GOLDSMITH, B. K., M.D., D.P.H. The Influence of School Life on the Spread of Scarlet Fever. *Lancet*, June 29th, 1907, p. 1765.

MURPHY, SIR SHIRLEY F. Variations in the Age-incidence of Mortality from Certain Diseases. *Lancet*, June 8th, p. 1566.

ROBERTSON, WILLIAM, M.D., D.P.H. An Outbreak of Epidemic Cerebro-spinal Meningitis. *British Medical Journal*, July 27th, 1907, p. 185.

The symptoms and infectivity of the disease are disarmed, as well as its treatment and prevention.

WALKER, E. W. A. On the Micro-organism Isolated from Acute Rheumatism. *British Medical Journal*, May 25th, 1907, p. 1233.

Hygiene of Special Classes. Trades, and Professions; and Municipal Administration.

"BUILDER," EDITOR OF THE. Another look at Letchworth. *Builder*, August 17th, 1907, p. 185.

General criticism, with plans and elevations.

COLLCUTT, THOMAS E., President R.I.B.A. The School Building and its Equipment. *Journal of the Royal Institute of British Architects.* August 31st, 1907, p. 652.

Address delivered at the opening of the Section of the International Congress on School Hygiene at the London University.

HALL, EDWIN T., V-P.R.I.B.A. Sanatoria for Consumptives. *Building News*, 29th March, 1907, p. 448.

Suitable sites—evolution in planning—low buildings most suitable—the Chalet type—the permanent sanatorium—essential details in design—cost.

WEBB, SIR ASTON, and BELL, E. INGRESS. Birmingham University. *Builder*, July 13th, 1907, p. 54.

Description of site, buildings, and construction. Illustrated by plans. Front elevation and siteplan.

WIKE, C. F., M.Inst.C.E. Town Planning. *Surveyor*, July 5th, 1907, pp. 4, 5.

Development of Sheffield—workmen's cottages—further powers required by municipal Authorities for dealing with estates to be laid out for building.

Watér Supply, Sewerage, and Refuse Disposal.

"BUILDER," EDITOR OF THE. Hampstead Heath and the sources of the Fleet. *Builder*, July 29th, 1907, p. 774.

Ancient history of the formation of the ponds to gather the flow from springs on south side of the hill.

CUTLER, HENRY A., M.Inst.C.E. Sewage Pumping Stations and Machinery. *Surveyor*, 24th May, 1907, pp. 623, 624.

Selection of site for pumping station—rainfall—volume of sewage—variations in flow—capacity of pumping plant—type of pump—oil engines and motors.

"ENGINEERING RECORD," THE. The New Water and Sewerage Systems of Manila. September 14th, 1907, p. 292.

The addition to the water supply of Manila, Philippine Islands, is described, including a dam to close a reservoir containing 2,000,000,000 gallons. Manila up to the present has been without a sewerage system; there are now 52 miles of sewers being constructed with an outfall into the Bay.

GLADWELL, ARTHUR, C.E. Notes on Public Works, and the Design and Construction of a Village Sewerage and Sewage Disposal Scheme. *Surveyor*, May 17th, 1907, pp. 588, 589.

The design and construction of a village drainage scheme—Burnham and Iver schemes—details of tanks and detritus and grit chambers—cost of works.

KIMBERLY, A. ELLIOTT. The Use and the Abuse of Sewage Purification Plants. *Surveyor*, August 30th, 1907, Supplement.

The problem of sewage purification—The sewage plants in Ohio (U.S.A.)—General efficiency of Ohio sewage purification plant—Neglect of sewage plant.

MATTHEWS, ERNEST ROMNEY, ASSOC. M. INST. C. E. Waterworks Construction in America. *Surveyor*, May 10th, 1907, p. 553.

Descriptions of reservoir works—The Natick reservoir—The Franklin reservoir—Covered reservoir at Louisville—Covered reservoir at Rockford—Illinois—Reinforced concrete cavity dam—At Theresa, N.Y.

MITCHELL, L., C.E. The Filtration of Water at Bolton. *Engineering*. June 7th, 1907, pp. 733, 734.

Standard of purity based upon micro-organisms—Sand filters—Rate of filtration—Mechanical filters—Bolton water and its treatment—Filtration plant.

THRESH, JOHN C., M.D., D.Sc. The Detection of Pollution in Underground Water, and Methods of Tracing the Source thereof. *Surveyor*, June 14th, 1907, p. 733.

Methods of locating sources of pollution—Outbreaks of typhoid fever—Systematic examination necessary—Wells, and their liability to pollution—Chemical tests for pollution—Presence of bacteria.

WATSON, JAMES, M.INST.C.E. Water Hardening. *Engineering*, June 21st, 1907, p. 833.

Comparisons between "softening" and "hardening" apparatus—Bradford water analyses before and after hardening—Description of the system employed at Bradford.

WATSON, J. DUNCAN, M.INST.C.E. Sewage Disposal by Biological Processes. *Building News*, June 28th, 1907, p. 882.

The elimination of solids without nuisance—Birmingham sewage disposal—Biological filters—Medium for bacteria habitat—Effluent—Birmingham statistics.

Heating, Lighting, and Ventilating.

ASTON WEBB, SIR, F.R.I.B.A. The Lighting and Ventilating of Class Rooms. *Building News*, August 16th, 1907, p. 205.

Paper opening set discussion at the Second International Congress on School Hygiene, at the London University, dealing with:—

Regulations as to sizes of class rooms—Height of Rooms—Aspect for securing best light—Too much glass not desirable—Reflected light—Heating—Radiators—Air inlets and extraction.

MEETINGS HELD.

SESSIONAL MEETINGS.

London, October 16th. The meeting was held in the Parkes Museum, when the adjourned discussion on "Suggested Amendments to the L.C.C. By-Laws as to Drainage," opened by Louis C. Parkes, M.D., D.P.H., J. Patten Barber, M.Inst..C.E., and Isaac Young, on May 29th, was continued; the chair was taken by Sir Shirley F. Murphy.

Ipswich, October 19th. The meeting was held in the Council Chamber, Town Hall, when a discussion on "The Recent Report of the Royal Commission on Tuberculosis" was opened by A. M. N. Pringle, M.B., C.M., D.P.H., Medical Officer of Health. The chair was taken by Col. J. Notter, M.A., M.D., R.A.M.C. Visits were made to the Corporation Electricity Station and the East Suffolk and Ipswich Hospital.

EXAMINATIONS.

The following Examinations have been held:—

Sanitary Science as applied to Buildings and Public Works.

Hong Kong, May 27th and 29th. 3 candidates; no certificate granted.
Derby, October 4th and 5th. 1 candidate; no certificate granted.
Liverpool, October 25th and 26th. 2 candidates; 2 certificates granted.

Inspectors of Nuisances.

Adelaide, S. Australia, June 13th and July 2nd. 21 candidates: 12 certificates granted.
Hong Kong, May 27th and 29th. 10 candidates; 7 certificates granted.
Derby, October 4th and 5th. 40 candidates; 16 certificates granted.
Liverpool, October 25th and 26th. 21 candidates; 10 certificates granted.

Hygiene in its bearing on School Life.

Derby, October 4th and 5th. 1 candidate; 1 certificate granted.
Liverpool, October 25th and 26th. 2 candidates; 1 certificate granted.

Inspectors of Meat and other Foods.

Birmingham, October 11th and 12th. 7 candidates; 2 certificates granted.

CANDIDATES WHO HAVE RECEIVED CERTIFICATES.

Sanitary Science as applied to Buildings and Public Works.

CURPHEY, CHARLES EDWIN. KIRK, ALLAN.

Inspectors of Nuisances.

ATKINSON, REGINALD JAMES.
BAKER, WILLIAM.
BARNETT, FRED.
BARNSLEY, HORACE BERNARD.
BULLIN, JOSEPH ALBERT.
CLARE, SAMUEL FREDERICK.
CLARKE, ERNEST.
CLARKSON, ERNEST WILLIAM.
COLE, ALFRED.
COOMBS, HARRY.
DARBY, FREDERICK WILLIAM.
EVANS, EVAN CARON.
FLETCHER, ROLAND.
GOODWIN, ANNIE HARBRON.
HINDE, CHARLES.
HITCHMOUGH, ALFRED HESKETH.
HODGSON, JOSHUA.
HYNES, THOMAS.
INGERSON, PHILIP FREDERIC.
INNS, FRED.
JONES, WALTER HENRY.
LANGMAN, ROY WILSON.
LISTER, JOHN ROBERT.
LOVE, ALFRED ROBERT.
MCEWEN, ROBERT GARDINER.
MACKAY, JOHN.
MIDGLEY, WILLIAM.
MITTON, JOHN EDWARD.
MODRA, RUDOLPH FREDERICK.
MOSS, SIDNEY ROBERT.
MULDOON, MARGARET F.
OAKES, REGINALD JAMES.
RIGG, S. CLIFFORD.
ROBERTS, LUCY ETHEL.
ROBINSON, HARRY.
SHIPLEY, GEORGE HAROLD.
SIMONS, WILLIAM.
SMITH, JOHN BERNARD.
SMITH, JAMES.
SWEETAPLE, THEODORA MAUDE.
WALTON, FREDERICK WILLIAM.
WARD, FREDERICK WILLIAM.
WILLIAMS, HENRY.
WILSON, HERBERT W.
WYLLIE, AGNES.

Hygiene in its Bearing on School Life.

BADGER, ISAAC. PINDER, WILLIAM BERNARD.

Inspectors of Meat and Other Foods.

MARTIN, WILLIAM. MORGAN, WILLIAM THOMAS.

FORTHCOMING MEETINGS.

SESSIONAL MEETINGS.

London, November 14th, at 8 p.m. Discussion on "The Smoke Problem in Large Towns," to be opened by Louis C. Parkes, M.D., D.P.H., Medical Officer of Health, Chelsea, and H. A. Des Vœux, M.D.

Leeds, Friday, November 29th, at 7.30 p.m. Discussion on "Modern Methods of Sewage Disposal, with special reference to the elimination of suspended matters," by G. A. Hart, Sewerage Engineer. On Saturday, November 30th, at 10 a.m., visits will be made to the Sewage Works, Waterworks, and the New Hospitals at Seacroft and Killingbeck.

Special Course on Food and Meat Inspection.

Fifth Special Course of Practical Training in Food and Meat Inspection for Commissioned Officers and Professional Men preparing for the Examination for Inspectors of Meat and Other Foods, conducted by The Royal Sanitary Institute, will commence on November 12th at 5.30 p.m.

Examinations.

In Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and
In Hygiene in its Bearing on School Life.

Inverness, November 1st and 2nd.
Bristol, „ 8th and 9th.
Newcastle, „ 15th and 16th.
Manchester, „ 29th and 30th.
London, December 6th and 7th.

Inspectors of Meat and Other Foods.

Bristol, November 22nd and 23rd.
London, December 13th and 14th.

Calendar, November and December, 1907.

As far as at present arranged.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

The Parkes Museum is open free, on Mondays 9.30 a.m. to 8 p.m., other days 9.30 a.m. to 5.30 p.m. The Library and Office are closed at 1 p.m. on Saturdays.

NOVEMBER.

1 F. Lecture to School Teachers at 7 p.m. "Physical Conditions," by J. Kerr, M.A., M.D.

1 F. Lecture to Sanitary Officers at 7 p.m. "Water Supply, Sources of Supply, and Distribution," by J. E. Worth, M.INST.C.E.

1 F. }
2 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Inverness.

2 S. Demonstration—Meat Inspectors' Course, at 2 p.m.

2 S. Demonstration at the Marylebone Workhouse and Public Baths, at 3 p.m., conducted by A. Saxon Snell, F.R.I.B.A.

4 M. Lecture to School Teachers, at 7 p.m. "Physical Exercises," by P. Boobbyer, M.D., M.S.

4 M. Lecture to Sanitary Officers at 7 p.m. "Sewerage," by J. E. Worth, M.INST.C.E.

6 W. Lecture to Sanitary Officers at 7 p.m. "Sewage Disposal," by J. E. Worth, M.INST.C.E.

8 F. Lecture—Meat Inspectors' Course at 6.30 p.m.

8 F. Lecture to Sanitary Officers at 7 p.m. "Scavenging, Disposal of House Refuse," by J. E. Worth, M.INST.C.E.

8 F.
9 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Bristol.

11 M. Lecture to Sanitary Officers at 7 p.m. "Signs of Health and Disease in Animals destined for Food, when alive and after slaughter; Tuberculin and other Tests," by Major J. A. Meredith, F.R.C.V.S.

12 T. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on "Meat Inspection," by James King, M.R.C.V.S.

12 T. Demonstration—Meat Inspectors' Course, at 6.30 p.m., on Foods, other than Meat, by Col. J. Lane Notter, R.A.M.C.

13 W. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

13 W. Inspection and Demonstration at Harrison & Barber's Knackers' Yard, Winthrop Street, Whitechapel, E., at 3 p.m. Conducted by R. Glover, F.R.C.V.S., Veterinary Inspector, County Borough of West Ham.

13 W. Lecture to Sanitary Officers at 7 p.m. "The Names and Situations of the Organs of the Body in Animals," by Major J. A. Meredith, F.R.C.V.S.

14 Th. Inspection and Demonstration at the Metropolitan Cattle Market, York Road, N., at 2 p.m. Conducted by James King, M.R.C.V.S.

14 Th. **Sessional Meeting,** LONDON, at 8 p.m. Discussion on "The Smoke Problem in Large Towns," to be opened by Louis C. Parkes, M.D., D.P.H., Medical Officer of Health, Chelsea, and H. A. Des Vœux, M.D..

15 F. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on "Meat Inspection," by James King, M.R.C.V.S.

15 F. Lecture to Sanitary Officers at 7 p.m. "Practical Methods of Stalling and Slaughtering Animals," by Major J. A. Meredith, F.R.C.V.S.

15 F.
16 S. { Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Newcastle.

16 S. Demonstration—Meat Inspectors' Course at 2 p.m.

16 S. Demonstration on Meat Inspection to Commissioned Officers and Professional Men at Metropolitan Cattle Market, at 3 p.m., by James King, M.R.C.V.S.

18 M. Lecture to Sanitary Officers at 7 p.m. "The Appearance and Character of Fresh Meat, Organs, Fat, Blood, Fish, Poultry, Milk, Fruit, Vegetables, and other food, and the conditions rendering them, or preparations of them, fit or unfit for human consumption. Preserving and Storing Meat and other foods," by E. Petronell Manby, B.A., M.D., D.P.H.

19 T. Demonstration on Inspection of Fish at Billingsgate Market, by J. Roberts, Chief Fish Inspector Fishmongers Co., at 10 a.m.

19 T. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

20 W. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

20 W. Lecture to Sanitary Officers at 7 p.m. The Hygiene of Byres, Lairs, Cowsheds, and Slaughterhouses, and all places where animals destined for the supply of food are kept, and the Hygiene of Markets, Dairies, and other places where food is stored, prepared, or exposed for sale, and transported, by E. Petronell Manby, B.A., M.D., D.P.H.

22 F. Lecture to Commissioned Officers and Professional Men, at 5.30 p.m., on Meat Inspection, by James King, M.R.C.V.S.

22 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

22 F. Lecture to Sanitary Officers at 7 p.m. The Laws, By-laws, and Regulations affecting the inspection and sale of Meat and other articles of Food, including their preparation and adulteration, by E. Petronell Manby, B.A., M.D., D.P.H.

22 F. }
23 S. } Examination for Inspectors of Meat and Other Foods, Bristol.

23 S. Demonstration to Commissioned Officers and Professional Men, at 3 p.m., at the Metropolitan Cattle Market, by James King, M.R.C.V.S.

25 M. Lecture to Commissioned Officers and Professional Men, at 5 p.m., on Tinned and Potted Food, by Prof. H. R. Kenwood, M.B., D.P.H.

26 T. Lecture to Sanitary Officers at 7 p.m., Diseased Meat, with a Demonstration of Morbid Specimens collected from Meat Markets, by James King, M.R.C.V.S.

26 T. Demonstration—Meat Inspectors' Course at 6.30 p.m., on Foods, other than Meat, by Col. J. Lane Notter, R.A.M.C.

27 W. Lecture to Commissioned Officers and Professional Men, at 5 p.m., on Milk, Butter, Cheese, etc., by Prof. H. R. Kenwood, M.B., D.P.H.

29 F. Lecture—Meat Inspectors' Course at 6.30 p.m.

29 F. }
30 S. } Examination in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Manchester.

29 F. }
30 S. } **Sessional Meeting,** Leeds, at 7.30 p.m. Discussion on "Modern Methods of Sewage Disposal, with special reference to the elimination of suspended matters," by G. A. Hart, Sewerage Engineer. On Saturday, at 10 a.m., visits to the Sewage Works, Waterworks, and the New Hospitals at Seacroft and Killingbeck.

30 S. Demonstration—Meat Inspectors' Course at 2 p.m.

30 S. Demonstration to Commissioned Officers and Professional Men, at 3 p.m., at the Metropolitan Cattle Market, by James King, M.R.C.V.S.

DECEMBER.

2 M. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Fish, Eggs, Tea, Coffee, Cocoa, Chocolate, and Lime-juice, by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

3 T. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Wheat, Rice, Arrowroot, and other Grains, Potatoes, Flour, Bread, Biscuits, Sugars, by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

4 W. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Succulent Vegetables and Fruits, Jams; the Condiments—Vinegar, Pepper, Mustard; Prepared, Concentrated, and Preserved Foods, by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

5 Th. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Alcoholic Beverages—Beer, Wines, Whisky, Brandy, etc., by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

6 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

6 F. Demonstration to Commissioned Officers and Professional Men at a Factory for Preparation of Concentrated and Preserved Foods.

6 F. }
7 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, London.

7 S. Demonstration—Meat Inspectors' Course, at 2 p.m.

7 S. Demonstration to Commissioned Officers and Professional Men at 3 p.m., at the Metropolitan Cattle Market, by James King, M.R.C.V.S.

13 F. }
14 S. } Examination for Inspectors of Meat and other Foods, London.

LIST OF FELLOW, MEMBERS AND ASSOCIATES ELECTED,

OCTOBER, 1907.

Reg. No. Date of Election.

FELLOW.

2289 1907. Oct. ABERDEEN, His Excellency the Earl of, P.C., G.C.M.G., *Vice-Regal Lodge, Dublin.*

MEMBERS.

M Marked thus have passed the Examination for Inspectors of Meat and Other Foods.
* Marked thus have passed the Examination in Sanitary Science as applied to Buildings and Public Works.
† Marked thus have passed the Examination for Local Surveyors.
‡ Marked thus have passed the Examination for Inspectors of Nuisances.
S Marked thus have passed the Examination in Hygiene in its bearing on School Life.

2307 1907. Oct. *ANDREWS, Josiah, *South Ville, Saltash, Cornwall.*

2313 1907. Oct. †BARNARD, L. W., *c/o Protheroe Phillott Barnard,* 13, *Promenade, Cheltenham.*

2290 1907. Oct. BLACKHAM, Major Robert J., D.P.H., *Royal Army Medical Corps, Devonport.*

2308 1907. Oct. *BOWEN, David John, *Maesderwen, Graig, Pontypridd, Glamorgan.*

2291 1907. Oct. BROWN, Cuthbert Chalmers, ASSOC. M. INST. C.E., *Assistant Engineer, Main Sewerage, Public Works, Cairo, Egypt.*

2309 1907. Oct. ‡*CARGILL, James Paulet, 167, *Fitzwarren Street, Salford.*

2292 1907. Oct. CHRISTIE, William Samuel, B.A., B.A.I.DUB., *Assistant Engineer, Main Sewerage, Public Works, Cairo, Egypt.*

2293 1907. Oct. CROTHALL, Harry George, *The Middlesex Guildhall, Westminster, S.W.*

2294 1907. Oct. DAVIES, William James, A.R.I.B.A., *Carlton Chambers, Baldwin Street, Bristol.*

2310 1907. Oct. M FOSTER, Arthur Norman, M.R.C.V.S., *The Town Hall, Sheffield.*

2295 1907. Oct. GRIFFITH, Frederick, M.INST.C.E., *Clarendon Lodge, Stoneygate, London Road, Leicester.*

2296 1907. Oct. GURNEY, Ronald George, P.A.S.I., *Surveyor and Inspector, Ledbury, Hereford.*

2311 1907. Oct. M HAMILTON, Daniel, M.R.C.V.S., *Bourtreehill, Hamilton, Lanark.*

2297 1907. Oct. S HEE, Young, *Headmaster, Government School, Victoria, Hong Kong.*

2312 1907. Oct. *JENKINS, John James, 29, *Essex Road, Acton, W.*

2298 1907. Oct.‡ *s* JOHNSON, Miss Ethel Gertrude Monica, 8, *Drakefell Road, St. Catherine's Park, Hatcham, S.E.*

2299 1907. Oct. KNIGHT, Frederick, 24, *Gertrude Street, Chelsea, S.W.*

2311 1901. Nov. *LAWSON, F. W., "*Vernon,*" 84, *Heytesbury Road, Subiaio, Western Australia.*

2300 1907. Oct. MENZIES, F. N. Kay, F.R.C.P.EDIN., D.P.H., *Suffield Chambers*, 79, *Davies Street, London, W.*

2301 1907. Oct. METSON, George, P.A.S.I., *H.M. Office of Works, Church Street, Islington, N.*

2302 1907. Oct. PINSON, Albert Onslow Wheeler Day, ASSOC.M.INST. C.E., *Assistant Engineer, Main Sewerage, Public Works, Cairo, Egypt.*

2303 1907. Oct. SWAN, Benjamin, 21, *Argyle Street, Willington Quay-on-Tyne, Northumberland.*

2304 1907. Oct. TAYLOR, John Francis (*M.O.H.*), M.R.C.S., L.S.A., D.P.H., 3, *Queen's Road, Leytonstone.*

2305 1907. Oct. THACKRAY, Frederick John, 13, *Devonshire Road, Burnley.*

2306 1907. Oct. WARD, Henry Payne, F.S.I., "*Burleigh,*" *Reigate Road, Redhill, Surrey.*

ASSOCIATES.

‡ Marked thus have passed the Examination for Inspectors of Nuisances.

S Marked thus have passed the Examination in Hygiene in its bearing on School Life.

M Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

4224 1907. Oct. ‡CRIDSEY, William Henry, 19, *Alexandra Terrace, Senyhenydd, Glamorganshire.*

4225 1907. Oct. ‡CLARKE, Reginald Charles, 13, *Ashland Terrace, Ilkley, Yorks.*

4226 1907. Oct. ‡CORDEN, Charles F., 126, *Waddon New Road, Croydon, Surrey.*

4227 1907. Oct. CRICHTON, Miss Ellen Copland, 26, *Lime Grove, Uxbridge Road, W.*

4228 1907. Oct. ‡EDMONDS, Walter, 14, *Castle Avenue, Rochester.*

4229 1907. Oct. ‡EVANS, Joshua, *The Mills, Llanybyther, Carmarthen.*

4230 1907. Oct. ‡GRANT, Miss Jessie I., 1, *Atholl Place, Edinburgh.*

4231 1907. Oct. ‡GREEN, Frank George, 3, *All Saints' Road, Weston-Super-Mare.*

4232 1907. Oct. *s* HALL, Miss Belle, 11, *Tower Street, Leicester.*

4233 1907. Oct. ‡HARRIS, Oliver Plowman, 18, *North Street, Leighton Buzzard.*

4234 1907. Oct. ‡HEAVEN, Frank Henry, 5, *Rock Street, Aberkenfig, Glamorgan.*

4235 1907. Oct. ‡Higham, Thomas Edwin, 66, *Scott Street*, *Warrington.*

4236 1907. Oct. ‡Hunter, Mrs. Annie, *Princess Christian College*, 19, *Wilmslow Road*, *Withington*, *Manchester.*

4237 1907. Oct. ‡Imms, H. Howard, 34, *Clarence Road*, *Sparkhill*, *Birmingham.*

4238 1907. Oct. ‡Johnson, James Edward, 1, *Roxwell Cottages*, *Harrow Weald*, *Middlesex.*

4239 1907. Oct. ‡Jones, Miss Elizabeth, *District Nursing Home*, 30, *Waterloo Road*, *Wolverhampton.*

4240 1907. Oct. ‡Jones, Urwick Meredith, 77, *Ryland Road*, *Edgbaston*, *Birmingham.*

4241 1907. Oct. ‡Karslake, Herbert J., *Inspector of Nuisances*, *Ilfracombe*, *Devon.*

4242 1907. Oct. ‡Lord, Mrs. Ann, 122, *Cross Lane*, *Radcliffe.*

4243 1907. Oct. ‡Lord, John Frederick, 45, *Bridge Street*, *Hereford.*

4244 1907. Oct. ‡Monks, James, 95, *Marsh House Lane*, *Warrington.*

4245 1907. Oct. ‡Morley, Bertie, *Portland House*, *Tenby.*

4246 1907. Oct. ‡Moss, Thomas, *Hill Side*, *Brinscall-in-Withnell*, *Lancashire.*

4247 1907. Oct. ‡Moulds, Charles, 24, *Baxter Avenue*, *Doncaster.*

4248 1907. Oct. *s* Noble, Miss Margaret, 9, *Hobart Street*, *Leicester.*

4249 1907. Oct. ‡Peters, Herbert, 15, *Salmon Parade*, *Bridgwater*, *Somerset.*

4250 1907. Oct. *m* Pitts, Charles, M.R.C.V.S., 37, *Albion Road*, *Idle*, *Bradford.*

4251 1907. Oct. *s* Platt, Miss Edith Annie, 2, *Ryburn Terrace*, *Sowerby Bridge*, *Yorks.*

4252 1907. Oct. ‡Powell, W. J., 130, *Montague Road*, *Smethwick.*

4253 1907. Oct. ‡Robinson, Ellis Wynne, 38, *Arnold Street*, *Princes Road*, *Liverpool.*

4254 1907. Oct. ‡Rogers, Arthur Sidney, *Bickford Grange*, *Penkridge*, *near Stafford.*

4255 1907. Oct. ‡Rowles, John Thomas William, 1, *Ferndale Street*, *Grangetown*, *Cardiff.*

4256 1907. Oct. ‡Seed, Miss Mary Gaskell, *Walthall House*, *Crewe.*

4257 1907. Oct. ‡Smart, Percy, *City Engineer and Surveyor's Department*, *Council House*, *Birmingham.*

4258 1907. Oct. ‡Teal, Fred, 9, *Siddal Grove*, *Siddal*, *near Halifax.*

4259 1907. Oct. ‡Wellsted, Alfred, 19, *Richmond Road*, *Brighton.*

4260 1907. Oct. Wetherell, Miss Florence Mary, *Hemel Hempsted*, *Herts.*

4261 1907. Oct. ‡Williams, Thomas Gower, *Forest Villa*, *Grove Road*, *Pontardawe*, *Glam.*

4262 1907. Oct. ‡Wingfield, William James, 72, *Sixth Avenue*, *Manor Park*, *E.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.*

DURING OCTOBER, 1907.

*** *For Publications of Societies and Institutions, etc., see under "Academies."*

ACADEMIES (AMERICAN).

American Institute of Architects. Proceedings of the Fortieth Annual Convention, 1906. 204 pp., 4to. Washington, 1907. *The Institute.*

Bombay Improvement Trust. Administration Report for the year ending 31st March, 1907. 32 pp., fcap. Bombay, 1907. *The Trust.*

Liverpool City Council. Artizans' and Labourers' Dwellings. 64 pp., 8vo. Liverpool, 1905. *Housing Committee.*

Local Government Board. Dr. R. W. Johnstone's Report upon an outbreak of Enteric Fever in the Urban Districts of Pontypool, Panteg, and Abersychan, with a brief account of the Sanitary Circumstances prevailing in these districts. No. 276. 26 pp., fcap. London, 1907.

——— Dr. Spencer Low's Report on the Sanitary Circumstances and Administration of the Borough of Morley, with special reference to the continued prevalence of infectious disease. No. 275. 27 pp., fcap. London, 1907.

——— Dr. S. W. Wheaton's Report on the Sanitary Circumstances and Administration of the Helmsley Rural District. 11 pp., fcap. London, 1907. *W. H. Power, C.B., F.R.S.*

McPherson, *J. A., M.Inst.C.E.* Waterworks Distribution: A practical guide to the laying out of systems of distributing mains for the supply of water to cities and towns. Second edition. 161 pp., 8vo. London, 1907. *B. T. Batsford (Publisher).*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Aberdeen, August, 1907	*Matthew Hay, M.D.*
Huddersfield, 1906	*S. G. Moore, M.D., D.P.H.*
Lincoln, 1906	*Charles Harrison, M.D., D.P.H.*
Newport (Mon.), 1906	*J. Howard-Jones, M.D., D.Sc., C.M.*
Northamptonshire C.C., 1906	*C. E. Paget, M.R.C.S.*
Nottingham, 1906	*P. Boobbyer, M.D., M.S., M.R.C.S.*

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* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

Metropolitan Water Board. Fourth Annual Report for year ended March 31st, 1907. 135 pp., 8vo. London, 1907. *The Board.*

Mill, *H. R.* The Distribution of Rain in Space and Time over the British Isles during the year 1906. 280 pp., 8vo. London, 1907. *The Author.*

New Jersey. Thirteenth Annual Report of the State Board of Health, 1906. 439 pp., 8vo. Trenton, N.J., 1907. *The Board.*

New York. *Department of Education.* Eighth Annual Report of the City Superintendent of Schools for the year ending July 31st, 1906. 479 pp., 8vo. New York, 1907. *The Board of Education.*

Partridge, *W., F.I.C.* The Bacteriological Examination of Disinfectants. 66 pp., 8vo. London, 1907. *Sanitary Publishing Co.*

Phelps, *E. B.* The Prevention of Stream Pollution by Strawboard Waste. 29 pp., 8vo. Washington, 1906. *W. Whitaker, B.A., F.R.S.*

Ravenhill, *Alice, F.R.San.I.* Lessons in Practical Hygiene, for use in Schools. 744 pp., 8vo. Leeds, 1907. *The Author.*

Registrar-General *of Births, Deaths, and Marriages in Scotland.* Fifty-First Detailed Annual Report (Abstracts of 1905). 676 pp., 8vo. Glasgow, 1907. *The Registrar-General.*

Sydney. Annual Report of Metropolitan Combined Sanitary Districts, 1906. 33 pp., fcap. Sydney, 1907. *W. G. Armstrong, M.B., D.P.H.*

In addition to the Books presented to the Library, the following have been published in connection with Sanitary Science :—

Adams, *Prof. Henry, M.Inst.C.E.* Engineers' Hand-book. London, 1907. *Cassell & Co.*

Andrewes, *F. W., M.A., M.D., D.P.H.* Lessons in Disinfection and Sterilization. Second Edition. London, 1907. *J. & A. Churchill.*

Brown, *Sir Hanbury, K.C.M.G.* Irrigation: its Principles and Practice. London, 1907. *Arch. Constable & Co.*

Bligh, —. The Practical Design of Irrigation Works. London. *Arch. Constable & Co.*

Burney, *Yeo, M.D., F.R.C.P.* Food in Health and Disease. London, 1907.

Burton-Fanning, *F. W., M.D.* The Open-Air Treatment of Pulmonary Tuberculosis. London, 1907. *Cassell & Co.*

Fletcher, *B.*, The London Building Acts, 1894–1905. Fourth Edition. London. *B. T. Batsford.*

Fletcher, *B., and* **Fletcher,** *H. P., F.R.I.B.A.* Architectural Hygiene, or Sanitary Science as applied to Buildings. Second Edition. London, 1907. *Whittaker & Co.*

Foster, *Sir Michael, M.D., K.C.B.* Text-Book of Physiology. Sixth Edition. London, 1907. *Macmillan & Co.*

Foster, *Sir Michael, M.D., F.R.S., and* **Shore,** *L. E., M.A., M.D.* Physiology for Beginners. London, 1907. *Macmillan & Co.*

Hazen, *Allen.* Clean Water, and how to get it. New York. *John Wiley & Sons.*

Hubbard, *Winifred D., and* **Kiersted,** *Wynkoop.* Waterworks Management and Maintenance. New York. *John Wiley & Sons.*

Hudson, *A. A.* The Law of Building, Engineering, and Ship-Building Contracts, and of the Duties and Liabilities of Engineers, Architects, Surveyors, and Valuers, with Precedents and Reports of Cases. Third Edition. London, 1907. *Sweet & Maxwell, Ltd.*

Huxley, *T. H., F.R.S.* Lessons in Elementary Physiology. London, 1907. *Macmillan & Co.*

Kingzett, *C. T.* Nature's Hygiene and Sanitary Chemistry. London. *Ballière, Tindall & Cox.*

McVail, *John C., M.D.* The Prevention of Infectious Diseases. London. 1907. *Macmillan & Co.*

Middleton, *G. A. T., A.R.I.B.A.* Modern Buildings: their Planning, Construction, and Equipment. London. *The Caxton Publishing Co.*

Smith, *Col. F., C.B., C.M.G.* A Manual of Veterinary Physiology. Third Edition. London. *Ballière, Tindall & Cox.*

Sutcliffe, *G. L., A.R.I.B.A.* The Modern Plumber and Sanitary Engineer. London, 1907. *The Gresham Publishing Co.*

The Municipal Engineers' Specification. London, 1907. *Builders' Journal.*

Ewart, *William, M.D.* Marine Climates in the Treatment of Tuberculosis. London, 1907. *Ballière, Tindall & Cox.*

LIST OF EXHIBITS ADDED TO THE MUSEUM.

Cast-Iron Drainage Fittings. Lantern slides and diagrams. Inspection chambers, double seal manhole covers, interceptor with anti-flood valve. *J. Jones (Chelsea) Ltd., Chelsea.*

Gully Trap, with special grating raised over surface level, and discharge pipe inlet placed in centre (Wood's patent). A self-cleansing effect is obtained without splashing. *Robert Wood, 53, Berners Street, W.*

Gully Trap, fitted with upright shallow backflow prevention valve. *The Sanitary Appliances Syndicate, Ltd., 68, Victoria Street, Westminster.*

Lavatory Fittings. White enamelled glass towel rail and nickelled fittings. *Standard Sanitary Manufacturing Co., 22, Holborn Viaduct.*

Lead Soil Pipe, removed from Boys' School, Isleworth. Extensive furring had taken place, largely decreasing bore. *W. S. King, Sunninghill, Ascot.*

Paper Milk-Pails. Receptacle for milk to prevent possible contamination from floating germs and dirt. To be destroyed after having been used once. Fitted with lid easy of removal. Owing to the non-conducting properties of paper the varying changes of temperature will not affect the milk stored. *Mono Service Vessels, Ltd., 58, Coleman Street, E.C.*

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

HYGIENE AND PUBLIC HEALTH.*

The names of these two well-known workers in sanitary science are a sufficient guarantee (if such were needed for a book on hygiene which has attained to a third edition within a brief period) of the worth of this manual. Setting aside the number and variety of scientific subjects which fall within its scope, it is no easy task to determine what to omit and what to include in order to give the student sound, intelligent, and technical knowledge of the facts and principles underlying the many-sided subject of hygiene.

The present edition of this book has been partly re-written, and otherwise added to and revised. We have gone through these pages, and in doing so have marked many of them for reference and comment; but it is not easy, nor is there any need, to do this in the space at our disposal. We may, however, especially direct the reader's attention to the chapter (II.) on the Collection, Removal, and Disposal of Excretal and other Refuse, which summarises our present knowledge of this most difficult question. The chapter (III.) on Air and Ventilation is one that will repay careful study. Chapter VI., on School Hygiene, is an important addition to this work, and it is the first time that it has received such a prominent part in any general work on hygiene. Chapters X. and XI. are especially interesting, and are full of information. In these chapters the subject of infectious diseases and infection in connection with the micro-organisms of modern bacteriological researches, and the existing views regarding immunity to disease are well and clearly set forth. It would be hopeless to attempt to keep pace with the almost daily developments and advances of this branch of sanitary science, but it is right to say that the authors of this manual have spared no pains to bring it up to date and to make it a trustworthy and valuable guide for all.

There is no volume known to us which is more reliable, more convenient, or in which the subjects are more fairly and clearly discussed, than in the volume under review, on which its authors are to be congratulated. J. L. N.

THE LAWS OF HEALTH.†

Dr. Carstairs Douglas is to be congratulated upon having written a most useful handbook on School Hygiene. As a compilation by one whose knowledge and experience amply qualify him to select the best and most useful of what

* Hygiene and Public Health, by Louis C. Parkes, M.D., D.P.H.. and Prof. H. R. Kenwood, M.D., D.P.H. 620 pp., 8vo. Third Edition. H. K. Lewis, 136, Gower Street, W.C. Price 10s. 6d.

† The Laws of Health: Handbook on School Hygiene, by Carstairs C. Douglas, M.D., D.Sc, 240 pp. London, 1907. Blackie and Sons. Price 3s.

has been written in the name of School Hygiene, it would be noteworthy for the sound judgment exercised in the selection of matter and for the good proportion maintained in the treatment of a comprehensive subject which deals with the normal and abnormal scholar, and the demands of hygiene with reference to his school environment. But it is a great deal more than a compilation, for the writer has had a wide experience as a teacher of hygiene, and evidence of this is forthcoming in the clear and direct manner in which he presents his subject: he has also undertaken various investigations in connection with scholars and schools, and the results of his work and experience are embodied in the book.

As I have said, the work is a generally well-balanced one, but the nervous system of the child is relatively of such paramount importance that it is to be hoped that in a subsequent edition something more of this and of the psychology of child-life will be included. The writer remarks in his preface that "Some may object that the sections dealing with anatomy and physiology are too short. This abbreviation is intentional. There are already excellent small manuals dealing with physiology suitable for the teacher's needs, and what is wanted is a book treating of the application of physiological knowledge to the hygiene of school life. The tendency in lectures on the laws of health is to overburden them with purely anatomical and physiological details, and so obscure their real purpose and lessen their value." The stricture contained in the last sentence is generally well deserved.

The book is suitably illustrated, and well produced by the publishers. It can be strongly recommended to the student of school hygiene as one of the best works upon that subject. H. R. K.

HEALTH IN THE SCHOOL.*

This book appears to me to deserve a high measure of commendation. It is designed to appeal to a class (school teachers) among whom a knowledge of hygiene is of paramount importance, and Dr. Elkington impresses this fact upon his readers in a chapter (chap. I.) which is the best general statement of what is implied in school hygiene, and what it secures for the scholar and teacher (both from the educational and physical standpoints), that I have yet read.

No physiological information is given in this manual. It is assumed that the teacher has already some familiarity with this subject.

Dr. Elkington shows the possession of such good judgment in the scope and manner of the treatment of his subject, and expresses himself with such force and freshness, that it is a pleasure to read his small work, and one lays it down with the hope that in the next edition he will somewhat amplify his information. This could be done with advantage, more especially, in respect of certain details of personal hygiene (clothing, washing, etc.), diseases of school life, forms of nervous disturbances in scholars, and physical exercises.

The book contains no sentence to which a fair critic can take exception; and this is not surprising when it is known that it is written by one who, in addition to having made a special study of the subject, has had a considerable practical experience of it. Indeed, it may be said that Dr. Elkington has been the pioneer of most of the school hygiene work now undertaken in Tasmania.

Chapters 1, 10, 11, and 12 are the best in an excellent little book with but one defect, its brevity. H. R. K.

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* Health in the School, by J. S. C. Elkington, M.D., D.P.H. 192 pp., 8vo. London, 1907. Blackie and Sons, Ltd. Price 2s.

INFANT MORTALITY.*

This book gives an excellent résumé of existing knowledge of infant mortality in various parts of the world.

In the first chapter, which deals with the present position of infant mortality, the salient fact is emphasised, that in England, in almost all European states, and indeed in practically all civilised states (excepting some of our own colonies), the rate of infant mortality is as high at the present day as it was seventy years ago.

In the second chapter the distribution of infant mortality in England and Scotland is shown by shaded maps, and the urban and rural mortalities are compared and in some measure explained. Urbanisation, as the author shows, fosters infant mortality, and especially in the later months of the first year. Immaturity is in some measure, and diarrhœa in a very high degree, more fatal in town than country.

Dealing with the fatal diseases of infancy, Dr. Newman writes truly, "infant mortality is not declining, owing to the fact that, while certain diseases have enormously decreased, prematurity, pneumonia, and epidemic diarrhœa have steadily increased, particularly in towns where the lamp of social life burns low."

In considering ante-natal influences affecting infant mortality, the author appears to favour the (apparently inevitable) conclusion that ill health on the part of the mother is the principal factor in producing a general unfitness to survive on the part of the child.

In natural sequence to this subject comes the occupation of women, and here Dr. Newman turns his eye on Lancashire towns, for illustration of the evils both directly and indirectly resulting from such employment, on the part of mothers, actual and potential.

A chapter is devoted to epidemic diarrhœa, its incidence and causation. This chapter, in brief, states that epidemic diarrhœa is mainly a disease of towns, and reaches its worst development in urban localities where dirt, poverty, overcrowding, and the social degradation these connote, are most conspicuous, when high temperature and low rainfall bring into being and distribute, for the most part by the agency of flies, dust, and the like, the infective agent or agents.

The special section on the influence of domestic and social conditions strikes, with necessary variations, much the same key as some of the preceding chapters. The following quotation from the Report of the Interdepartmental Committee on Physical Deterioration, which the author gives, sufficiently indicates his conclusion: "Laziness, want of thrift, ignorance of household management, and particularly of the choice and preparation of food, filth, indifference to parental obligations, and drunkenness" . . . . "largely infect adults of both sexes and press with terrible severity upon their children." This chapter concludes with the appropriate quotation; "The people perish for lack of knowledge."

There is an excellent chapter on infant feeding, in which the enormous advantage of breast-feeding to the child (especially as regards the avoidance of alimentary infection) is emphasized. The author truly states that "even the domestic and social conditions are reducible to terms of nourishment."

In dealing with preventive measures, Dr. Newman necessarily mentions crèches, but is careful to class them as only palliative devices. He strikes the right note in stating that "no scheme of assisting maternity can ever have a

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* Infant Mortality: A Social Problem, by George Newman, M.D., D.P.H., F.R.S.F. 356 pp., 8vo. London, first published 1906. Methuen & Co. Price 7s. 6d. net.

wholesome effect which lessens the sense of responsibility or minimises the essential value of personal service." He gives prominence to M. and Madame Coullett's Parisian scheme for providing meals gratuitously to nursing mothers. This scheme has met with much success (since its inauguration in 1904) and appears to be sound in principle.

Dr. Newman tells the usual somewhat disappointing tale of the results achieved by milk depots, so far as actual infant life conservancy is concerned, but is careful to mention the possible educational value of these depots, which, however, it is difficult to estimate by statistical methods.

He emphasises the necessity for greater care and cleanliness in the drawing, storage, and conveyance of milk, with which all must agree, and shows that in this, as in other matters, we are considerably behind several other countries, as regards business methods and organisation.

The book concludes with several tabular appendices, giving details of infant mortality, mortality from alcoholism, and of temperature, rainfall, etc., also reprints of infant-feeding leaflets, and a résumé of the Infant Life Protection Act, 1897. The volume teems with statistical information, and furnishes besides a mass of expert opinion on what is at once the major part of a great social problem, and the darkest blot upon the scutcheon of our modern civilisation.

P. B.

APPLIED BACTERIOLOGY.*

The book contains some 470 pages, and is published as a third edition of Pearmain and Moor's "Applied Bacteriology." In order to bring the work up to date it has been practically re-written and considerably enlarged, the coloured plates of cultures and cover-glass preparations present in the former editions being retained. Bacteriology from a medical point of view is dealt with at some length, and there is an extensive chapter devoted to disinfection and disinfectants. As the authors remark in the preface, it would not be possible in one volume to deal completely with each of the numerous branches of the subject that are implied by the title, but the book should prove a valuable reference to those interested in bacteriology. S. R.

A LABORATORY HANDBOOK OF BACTERIOLOGY.†

This is an English translation of Abel's well-known handbook, supplemented with additions by the translator, Dr. Horder, and Dr. Houston. These additions have reference to the more important methods introduced in the course of recent developments of bacteriology in this country. The need of such a small manual has long been felt in England. It cannot, and is not meant to, take the place of a textbook or of personal instruction, but will serve as a supplement to the above, giving practical hints, and collecting in practical form those technical details which so easily slip the memory. Considering the amount of technical detail which the book contains, it is remarkably free from errors. We heartily

* Applied Bacteriology, by C. G. Moor, M.A., F.I.C., and R. T. Hewlett, M.D., D.P.H. 475 pp. London, 1906. Baillière, Tindall, & Cox, Henrietta Street, Strand, W.C. Price 12s. 6d.

† Abel's Laboratory Handbook of Bacteriology, translated from the tenth German edition by M. H. Gordon, M.A., M.D. London: Henry Frowde, Oxford University Press, and Hodder and Stoughton. 1907. 218 pp. Price 5s.

recommend this handbook as an essential asset to every laboratory, and heartily congratulate both the translator and the Oxford University Press on the publication of a truly practical handbook. R. H. F.

AIR-CURRENTS AND THE LAWS OF VENTILATION.*

The author states that this is his last will and testament in respect of ventilation. The book represents a short course of lectures delivered before the University in 1903, and is an attempt to adapt the nomenclature and methods of electrical measurement (and of Wheatstone's bridge in particular) to ventilation problems. Dr. Shaw adopts de Chaumont's standard of 1 cubic foot per second of fresh air per person, with the reservation that "if this allowance is regarded as too high some other should be adopted after due deliberation." The reviewer would like to know why 1 cubic foot per second has been so universally accepted; surely the factor of safety must depend on (1) the percentage of oxygen in the room and (2) the percentage, if any, of injurious ingredients. It is now some time since de Chaumont put forward this standard, and one would have thought that the due deliberation wanted by Dr. Shaw had already been taken. It seems a pity that the author has not been able to suggest a more reasonable standard himself.

On page 10 we find that the author remarks that it is well known that, in a long uniform channel, part of the expenditure of energy depends upon friction proportional to the velocity, whereas the production of velocity or kinetic energy, will require power proportional to the square of the velocity produced. We were under the impression that friction losses varied as the square of the velocity, and were therefore also proportional to the kinetic energy. The correction, however, does not vitiate the author's conclusion that the law of relation between head and flow in ventilation circuits is $H=RV^2$.

The book is excellent reading, and no one interested in ventilation problems should fail to read it. S. R.

DRAINAGE PROBLEMS OF THE EAST.†

These two volumes (the second consisting entirely of plans) are a revised and enlarged edition of the author's well-known "Oriental Drainage," and furnish an exhaustive study of the modifications in engineering practice which eastern conditions necessitate. The author is conversant with the drainage systems of Karachi, Calcutta, Rangoon, Singapore, Penang, Shanghai, and Alexandria, so that his experience extends over a wide geographical area. One of the most interesting points alluded to is the rapidity of the septic changes in sewage, resulting in a large production of septic gas, rendering it possible to use this gas for power purposes in a variety of ways, and in the opinion of the author there is a great future for tank gas in the east. The vegetable food supply of the native population in India, on the other hand, and the high temperature conditions seem to determine a large percentage of carbonic acid in the tank gases; it is interesting, however, to note that hydrogen is a constant constituent, and is present in about $\frac{2}{3}$ volume of the marsh gas. S. R.

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* Air Currents and the Laws of Ventilation, by W. N. Shaw, F.R.S. 104 pp., 8vo. Cambridge University Press, 1907. Price 3s.

† Drainage Problems of the East, by C. C. James, M.Inst.C.E. 378 pp. (plans). Vols. I. & II. Bombay, 1906. *The Times of India*, 121, Fleet St., London, E.C. Price 30s. net.

NOTES OF BOOKS.

MODERN DRAINAGE INSPECTION AND SANITARY SURVEYS.*

The intention of this book is to give some practical hints upon drain testing and the carrying out of sanitary surveys, and to householders and laymen interested in drainage questions.

The book is arranged in seven chapters dealing with Testing Apparatus—the Inspection of the Interior and Exterior of a House, Testing, Notes and Notebooks, Reports—Supervision and Alterations, with appendices, "Copies of Notes and Reports."

There are numerous illustrations of sanitary appliances particularly relating to drainage work.

VENTILATION, HEATING AND LIGHTING.†

The object of this book, written from the sanitary engineer's point of view, is to deal with the practical side of ventilation, heating and lighting, and the book is intended to assist those candidates preparing for professional examinations.

The chief sources of the information are indicated by foot notes, so that those who wish to make an exhaustive study of the subjects may readily refer to the standard works mentioned.

A list of works on the subject and of manufacturing engineers is given in an appendix.

EDUCATION HANDWORK, AND SYSTEMATIC COLOUR INSTRUCTION FOR CHILDREN, BASED ON THE SPECTRUM.‡

In ten chapters the book deals with the importance of colour in education, spectrum colour apparatus and materials, lessons for babies and children under five, second class children, juniors, and some notes on design and colour in connection with design, spectrum colour tops and other handwork lessons for juniors.

The book is freely illustrated with colour designs and effects, and gives examples of paper folding and symmetrical cutting.

SWIMMING POOLS.§

This book deals with the construction of swimming pools, their mechanical installations, water supply, various types of installations adopted to different conditions. There are some thirty illustrations and charts.

THE REDUCTION OF CANCER.‖

This thesis is a review of the subject dealing with the relationship of food to the cancer death-rate in different countries.

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* Modern Drainage Inspection and Sanitary Surveys, by Gerard J. G. Jensen, C.E. Second Edition. 131 pp., 8vo. London, 1907. The Sanitary Publishing Co., Ltd. Price 2s. 6d. net.

† Ventilation, Heating, and Lighting, by William H. Maxwell, Assoc. M. Inst. C.E. Second Edition. 151 pp., 8vo. London, 1907. The Sanitary Publishing Co., Ltd. Price 3s. net.

‡ Education Handwork and Systematic Colour Instruction for Children, based on the Spectrum, by Florence Kirk. 188 pp., 8vo. Leeds, 1907. E. J. Arnold & Sons, Ltd. Price 5s. net.

§ Swimming Pools, by J. K. Allen. 63 pp., 8vo. Chicago, 1907. "Domestic Engineering." Price 50 cents.

‖ The Reduction of Cancer, by the Hon. Rollo Russell. 62 pp., 8vo. London, 1907. Longmans, Green & Co. Price 1s. 6d.

ARTICLES RELATING TO PUBLIC HEALTH,*

Appearing in the chief British and Foreign Journals and Transactions.

Abstracts of Titles classified in this List under the following headings:—

Science in Relation to Hygiene and Preventive Medicine.
Hygiene of Special Classes, Trades, and Professions; and Municipal Administration.
Building Materials, Construction, and Machinery.
Water Supply, Sewerage, and Refuse Disposal.
Heating, Lighting, and Ventilating.
Personal and Domestic Hygiene.

The articles referred to in this list are as far as possible collected and filed in the Library of the Institute for the use of the Members and Associates.

Building Materials, Construction, and Machinery.

BURR, W. H. The Reinforced Concrete Work of the McGraw Building. *Engineering Record*, 26th Oct., 1907, p. 455.

Illustrated description of a large building now being erected in New York entirely of reinforced concrete, 126 ft. by 90 ft. in plan, and 150 ft. high.

"ENGINEERING RECORD." New Reinforced Concrete Regulations in Philadelphia. 2nd Nov., 1907, p. 477.

Reprint of the regulations of the Bureau of Building Inspection of Philadelphia in regard to the use of reinforced concrete.

Water Supply, Sewerage, and Refuse Disposal.

"ENGINEERING RECORD." The Sewage Purification Plant at Reading, Pennsylvania. 5th Oct., 1907, p. 362.

The sewage purification was begun about twelve years ago, when a two-deck filter was constructed. The upper deck acted partly as screen and partly as filter, and as the new house connections increased the filter became overtaxed. About sixty additional miles of sewers having been contracted for, a new installation of a sewage screening device, a septic tank, a sprinkling filter, and a final settling basin is being constructed. The appliances are fully described and illustrated.

Heating, Lighting, and Ventilating.

"ENGINEERING RECORD." Heating and Ventilating the Commercial National Bank Building, Chicago. 26th Oct., 1907, p. 466.

Part I. of illustrated description of heating and ventilating arrangements for eighteen story steel frame building, 181 ft. by 190 ft.

——— Heating System of the St. Francis' Home, Detroit, Mich. 19th Oct., 1907, p. 427.

Illustrated description of the heating and ventilating of the St. Francis' Home for Orphan Boys. (300 inmates, besides attendants and staff.)

* Members or Associates wishing to file or catalogue these Titles can, on application, be supplied with excerpt copies for this purpose.

MEETINGS HELD.

Sessional Meetings.

London, November 14th, at 8 p.m. The meeting was held in the Parkes Museum, when a discussion on "The Smoke Problem in large Towns" was opened by Louis C. Parkes, M.D., D.P.H., and H. A. Des Vœux, M.D. The chair was taken by Sir William B. Richmond, K.C.B., R.A.

Leeds, November 29th. The meeting was held in the Council Chamber, Town Hall, when a discussion on "Modern Methods of Sewage Disposal, with special reference to the elimination of suspended matters," was opened by G. A. Hart, Sewerage Engineer, Leeds. The chair was taken by H. D. Searles Wood, F.R.I.B.A., Chairman of the Council of the Institute. On Saturday, November 30th, visits were made to the Headingly Waterworks Filter Beds, the Rodley Sewage Works, and the City Fever Hospital at Seacroft, where the members were entertained at tea by the Hospitals Committee. Special cars were provided to take the members to the different works.

Examinations.

The following Examinations have been held :—

Sanitary Science as applied to Buildings and Public Works.

Bristol, November 8th and 9th ...	2 candidates;	1 certificate granted.
Newcastle, Nov. 15th and 16th ...	1 candidate;	1 certificate granted.

Inspectors of Nuisances.

Brisbane, July 19th	7 candidates;	6 certificates granted.
Inverness, November 1st and 2nd .	3 candidates;	2 certificates granted.
Bristol, November 8th and 9th ...	24 candidates;	9 certificates granted.
Newcastle, Nov. 15th and 16th ...	23 candidates;	12 certificates granted.

Hygiene in its bearing on School Life.

Newcastle, Nov. 15th and 16th ...	1 candidate;	1 certificate granted.

Inspectors of Meat and other Foods.

Bristol, November 22nd and 23rd .	4 candidates;	2 certificates granted.

Candidates who have received Certificates.

Sanitary Science as applied to Buildings and Public Works.

Bell, William. Smith, Roland Ingleby.

Inspectors of Nuisances.

ALVES, HAROLD N.
AMOS, WILLIAM.
ARMSTRONG, THOMAS DODGSON.
BEST, ALFRED THOMAS.
BOWMAN, CHARLOTTE ANNIE.
BYRES, WILLIAM.
CAVE, DANIEL WALTER.
COLLINSON, ALFRED WILLIAM.
DANIEL, FRANCIS ISAAC SMYTHERS.
DE LANGE, WILLIAM.
DYER, FREDERICK JAMES.
FORTUNE, SIDNEY HERBERT.
FOSTER, THOMAS.
HASLER, ARTHUR THOMAS.
HENLEY, WILLIAM JAMES.
JONES, GWILYM ANEURIN.
LEE, ELIZA.
LEE, LETITIA.
LOVELL, HAROLD BRIMBLE.
MCKERROW, JAMES WEIR.
MATTICK, ALLAN WALTER GEORGE.
MILNE DAVID DAWSON.
MUCKLE, ROBERT.
PALLISTER, WILLIAM JOHN.
RAINE, WILLIAM STEPHENSON.
REED, GEORGE.
ROBERTSON, JOHN DUNCAN.
ROBERTSON, LAURENCE.
WILSON, WILLIAM GIBSON.

Hygiene in its Bearing on School Life.

LINDSAY, JEAN RACHEL.

Inspectors of Meat and other Foods.

FEARNS, FREDERICK JAMES. JONES, THOMAS.

FORTHCOMING MEETINGS.

SESSIONAL MEETING.

Manchester, Friday, December 13th, at 7.30 p.m., in the Municipal Technical School. Discussion on "The Butter Supply," to be opened by Mr. Wilson, Manchester Co-operative Wholesale Society; followed by Meredith Young, M.D., M.S., D.P.H., D.S.Sc., Medical Officer of Health, Stockport; Robert Bell, Assistant Prosecuting Solicitor, Manchester; and A. T. Rook, Superintendent, Sanitary Dept., Manchester; and "Small Dwellings," by Prof. J. Radcliffe, C.E., F.R.Met.Soc., M.Sc.Tech.; followed by J. Corbett, Borough Engineer, Salford; and J. Coghan Horsfall.

On Saturday, December 14th, visits will be made to Model Lodging House, Artizans' and other Dwellings, and to Sewage Purification Works. Salford.

EXAMINATIONS.

In Sanitary Science as applied to Buildings and Public Works,
For Inspectors of Nuisances, and
In Hygiene in its Bearing on School Life.

London, December 6th and 7th.
Plymouth, January 24th and 25th, 1908.

Inspectors of Meat and Other Foods.

London, December 13th and 14th.

CALENDAR, DECEMBER, 1907, AND JANUARY, 1908.

As far as at present arranged.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

The Parkes Museum is open free, on Mondays 9.30 a.m. to 8 p.m., other days 9.30 a.m. to 5.30 p.m. The Library and Office are closed at 1 p.m. on Saturdays.

DECEMBER.

2 M. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Fish, Eggs, Tea, Coffee, Cocoa, Chocolate, and Lime-juice, by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

3 T. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Wheat, Rice, Arrowroot, and other Grains, Potatoes, Flour, Bread, Biscuits, Sugars, by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

4 W. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Succulent Vegetables and Fruits, Jams; the Condiments Vinegar, Pepper, Mustard; Prepared, Concentrated, and Preserved Foods, by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

5 Th. Lecture to Commissioned Officers and Professional Men, at 5 p.m. Alcoholic Beverages—Beer, Wines, Whisky, Brandy, etc., by Col. J. Lane Notter, M.A., M.D., D.P.H., R.A.M.C.

6 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

6 F. Demonstration to Commissioned Officers and Professional Men at a Factory for Preparation of Concentrated and Preserved Foods.

6 F. } 7 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, London.

S. Demonstration—Meat Inspectors' Course, at 2 p.m.

7 S. Demonstration to Commissioned Officers and Professional Men at 3 p.m., at the Metropolitan Cattle Market, by James King, M.R.C.V.S.

13 F. } 14 S. } Examination for Inspectors of Meat and other Foods, London.

13 F. } 14 S. } **Sessional Meeting**, MANCHESTER, at 7.30 p.m. Discussion on "Butter Supply," opened by Mr. Wilson, Manchester Co-operative Wholesale Society; Meredith Young, M.D., D.P.H., M.O.H., Stockport; and Robert Bell, Assistant Prosecuting Solicitor, Manchester; and on "Small Dwellings," opened by Prof. J. Radcliffe, C.E., F.R.MET.SOC., M.SC.TECH.
On Saturday, visits will be made to Model Lodging House, Artizans' and other Dwellings, and to Sewage Purification Works, Salford.

JANUARY, 1908.

24 F. } 25 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Plymouth.

JULY.

13—19 **Congress and Exhibition, Cardiff.**

MEMBERS AND ASSOCIATES ELECTED, NOVEMBER, 1907.

MEMBERS.

‡ Marked thus have passed the Examination for Inspectors of Nuisances.

Reg. No.	Date of Election.	
2315	1907. Nov.	ALDRIDGE, Lieut.-Col. A. R., R.A.M.C., M.B., C.M., D.P.H., *Army Head Quarters, Simla, India.*
2316	1907. Nov.	ARKLE, Alexander S., M.A.CANTAB., M.R.C.S., L.R.C.P., 24, *Rodney Street, Liverpool.*
2317	1907. Nov.	BAINES, Arthur Capel Valentine, *Town Engineer, Somerset East, Cape Colony, South Africa.*
2318	1907. Nov.	BURNETT, John, F.S.I., *Gopsall Estate Office, Leicester.*
2319	1907. Nov.	CHEATLE, Arthur, F.R.C.S., L.R.C.P., 18, *Savile Row W.*
2320	1907. Nov.	FOGGIN, George, B.A., L.R.C.P., L.R.C.S., 24, *Eldon Square, Newcastle-upon-Tyne.*
2321	1907. Nov.	HEAP, James Alwin, *Borough Engineer and Surveyor, Town Hall, Todmorden.*
2322	1907. Nov.	HORSLEY, Sir Victor A. H., M.B., B.S., F.R.C.S., F.R.S., 25, *Cavendish Square, W.*
2323	1907. Nov.	‡KNAPP, Robert Walter, *Borough Surveyor and Inspector of Nuisances, Town Hall, Andover.*
2324	1907. Nov.	KENNA, Denis P., L.R.C.P.I., L.R.C.S.I., *Baltinglass, Co. Wicklow.*
2325	1907. Nov.	KHEDKAR, Raghunath Vithal, F.R.C.S.I., D.P.H., 48, *Wellington Road, St. John's Wood, N.W. (Darbar Surgeon, Kolhapur, India.)*
2326	1907. Nov.	LETTS, Professor Edmund Albert, D.SC., PH.D., *Shirley Lodge, Cultra, Co. Down.*
2327	1907. Nov.	MACCRINDLE, James Doig, M.B., C.M., D.P.H., (*M.O.H.*), 20, *Guildhall Road, Northampton.*
2328	1907. Nov.	MCWALTER, James Charles, M.A., M.D., D.P.H., 19, *North Earl Street, Dublin.*
2329	1907. Nov.	MILES, George Roslyn, 79, *Sterndale Road, West Kensington, W.*
2330	1907. Nov.	MORLAND-JOHNSON, Edward Thomas, 2, *Railway Road, Urmston, near Manchester.*

2331 1907. Nov. O'HAGAN, Lady, *Pyrgo Park, Havering-atte-Bower, Essex.*

2332 1907. Nov. OSENTON, Charles, F.S.I., *Surveyor and Estate Agent, Epsom.*

2333 1907. Nov. PRENTICE, Thomas Theophilus, ASSOC.M.INST.C.E., *Empresa del Agua, Lima, Peru, South America.*

2334 1907. Nov. PRINGLE, Arthur Maxwell Nicholson, M.B., C.M., D.P.H., (*M.O.H.*), *Exchange Chambers, King Street, Ipswich.*

2335 1907. Nov. PROSSER, Howell, *Education Committee Offices, Walthamstow, N.E.*

2336 1907. Nov. RAW, Nathan, M.D., F.R.C.S., M.R.C.P., F.R.S.E., 66, *Rodney Street, Liverpool.*

2337 1907. Nov. SCHARLIEB, Mrs. Mary, M.D., M.S., 149, *Harley Street, W.*

2338 1907. Nov. SMITH, Cyril Herbert, F.S.I., *The Limes, St. Mary's Street, Chippenham.*

2339 1907. Nov. SPIERS, Ernest Isidore, B.A.(ENG.)CANTAB, 76, *Stepney Green, E.*

2340 1907. Nov. TUCKER, Captain Albert N., R.E., *Turf Club, Cairo, Egypt.*

2341 1907. Nov. TUKE, Miss Margaret J., M.A., *Principal, Bedford College, York Place, Baker Street, W.*

2342 1907. Nov. TWEEDY, Sir John, F.R.C.S., LL.D., 100, *Harley Street, W.*

ASSOCIATES.

‡ Marked thus have passed the Examination for Inspectors of Nuisances.
S Marked thus have passed the Examination in Hygiene in its bearing on School Life.

4263 1907. Nov. ‡ATKINSON, Reginald James, 10, *York Street, Penrith.*

4264 1907. Nov. ‡BAKER, William, 291, *Edward Street, Nuneaton.*

4265 1907. Nov. ‡BARNETT, Fred., 46, *Newbridge Street, Wolverhampton.*

4266 1907. Nov. ‡BARNSLEY, Horace Bernard, *Cotteridge Stores, King's Norton.*

4267 1907. Nov. S BEALE, Miss Rose Madeleine, 165, *Lauderdale Mansions, Maida Vale, W.*

4268 1907. Nov. ‡CLARE, Samuel Frederick, *Ickworth Road, Sleaford.*

4269 1907. Nov. ‡CLARKSON, Ernest William, 27, *Treesdale Road, Harrogate.*

4270 1907. Nov. ‡FLETCHER, Roland, *Clay Street, Penkridge, Staffs.*

4271 1907. Nov. ‡Goodwin, Miss Annie Harbron, 4, *Manley Road, Waterloo, Liverpool.*

4271 1907. Nov. ‡Howard, H. C., 17, *Brunswick Street, Walthamstow.*

4272 1907. Nov. ‡Hurley, Frederick J., *Lindley, Crickhowell, Breconshire.*

4273 1907. Nov. ‡Lister, John R., 6, *Manygates Terrace, Sandal, near Wakefield.*

4274 1907. Nov. ‡Midgley, William, *Thimble Hall, Cawthorne, near Barnsley.*

4275 1907. Nov. ‡Oakes, Reginald James, 49, *High Street, Bewdley, Worcester.*

4276 1907. Nov. s Pinder, William Bernard, 55, *Trent Valley Road, Lichfield.*

4277 1907. Nov. ‡Sharp, Miss Amy Louisa, *Richmond Lodge, Hessle, Yorks.*

4278 1907. Nov. ‡Shipley, George Harold, 25, *Regent Park Terrace, Hyde Park, Leeds.*

4279 1907. Nov. ‡Topping, Thomas, 147, *Maidstone Road, Rochester.*

4280 1907. Nov. ‡Wilson, Herbert W., *Brooklyn, Attleborough, Nuneaton.*

CONTRIBUTIONS AND ADDITIONS TO LIBRARY.*

*** *For Publications of Societies and Institutions, etc., see under "Academies."*

ACADEMY (American).

Philadelphia. Third Annual Report of the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis. 410 pp., 8vo. Philadelphia, 1907. *The Institute.*

ACADEMIES (British).

London. *Institution of Mechanical Engineers.* Proceedings of, March–May, 1907. 234 pp., 8vo. London, 1907. *The Institution.*

——— *Royal Institute of British Architects.* Calendar of, 1907–1908. 433 pp., 8vo. London, 1907. *The Institute.*

——— *Royal College of Surgeons of England.* Calendar of, 1907. 474 pp., 8vo. London, 1907. *The College.*

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* Members or Associates wishing to file or catalogue these Titles can, on application be supplied with excerpt copies for this purpose.

ACADEMIES (Foreign).

Amsterdam. *Section of Sciences.* Proceedings of, Vol. IX., Parts I. and II. 898 pp., 4to. Amsterdam, 1906 and 1907.

——— Verslag Van De Gewone Vergaderingen Der Wis-en Natuurkundige Afdeeling. 982 pp., 4to. Amsterdam, 1906 and 1907.
Académie Royale des Sciences, à Amsterdam.

Abel, *Professor.* Laboratory Handbook of Bacteriology. Translated from the Tenth German Edition by M. H. Gordon, M.A., M.D., B.Sc., with additions by Dr. A. C. Houston, Dr. T. J. Horder, and the Translator. Price 5s. net. 224 pp., 8vo. London, 1907.
The Joint Committee of Henry Froude, and Hodder & Stoughton (publishers).

Buckley, *G. Granville, M.D., Ch.B., D.P.H.* The Resistance of some Pathogenic Micro-organisms to Drying. Reprinted from "Public Health," February, 1907. 8 pp., 8vo. Bristol, 1907. *The Author.*

Dixon, *S. G., M.D.* Law. The Foundation of State Medicine. Reprinted from the Journal of the American Medical Association. 23 pp., 8vo. Chicago, 1907. *The American Medical Association.*

Gorst, *Rt. Hon. Sir John E.* The Children of the Nation. How their Health and Vigour should be promoted by the State. 307 pp., 8vo. London, 1906. *Purchased.*

Langelaan, *Dr. J W.* On Congenital Ataxia in a Cat. Verhandelingen der Koninklijke Akademie van Wetenschappen te Amsterdam. (Tweede Sectie). Deel XIII., No. 3. 22 pp., 4to. Amsterdam, 1907.
Académie Royale des Sciences à Amsterdam.

Local Government Board. Thirty-fifth Annual Report of the Medical Officer for the year 1905–6. 600 pp., 8vo. London, 1907.

——— Dr. R. Deane Sweeting's Report on the General Sanitary Circumstances and Administration of the Huntingdon Rural District, with especial reference to Flooding of the District by the River Ouse and its Tributaries. No. 278. 20 pp., fcp. London, 1907.

——— Dr. W. W. E. Fletcher's Report upon the Sanitary Circumstances and Administration of the Leyburn Rural District. No. 279. 10 pp., fcp. London, 1907.

——— Dr. Theodore Thomson's Report on the Sanitary Circumstances and Administration of the Yeovil Rural District. No. 280. 10 pp., fcp. London, 1907.

——— Dr. R. J. Reece's Report upon the Sanitary Circumstances and Administration of the Witham Urban District. No. 281. 10 pp., fcp. London, 1907.

——— Dr. R. J. Reece's Report upon the Sanitary Circumstances and Administration of the Braintree Urban District. No. 282. 12 pp., fcp. London 1907. *W. H. Power, C.B., F.R.S.*

MEDICAL OFFICERS OF HEALTH AND OTHER SANITARY REPORTS.

Glasgow, 1906 .. .. .. *A. K. Chalmers, M.D., D.P.H.*

London, Thirteen weeks ending 12th October, 1907 .. .. .. *W. Collingridge, M.D., D.P.H.*

Manchester (Rivers Department), year ending March 27th, 1907 .. *Chairman, Rivers Committee.*

Toronto, City Engineer's Report, 1906 .. .. *C. H. Rust.*

West Riding C.C., 1906 .. .. *J. R. Kaye, M.B., D.P.H.*

Newman, *G., M.D., D.P.H., F.R.S.E.* Infant Mortality. A Social Problem. 356 pp., 8vo. London, 1906. Price 7s. 6d. net. *Purchased.*

Parkes, *Louis C., M.D., D.P.H.*, and **Kenwood,** *H. R., M.B., D.P.H.* Hygiene and Public Health. Third Edition. 620 pp., 8vo. London, 1907. Price 10s. 6d. *H. K. Lewis (publisher).*

Russell, *Hon. Rollo.* The Reduction of Cancer. Price 1s. 6d. net. 62 pp., 8vo. London, 1907. *Longmans, Green & Co. (publishers).*

Schaefer, *T. W., M.D.* The Contamination of the Air of our Cities with Sulphur Dioxide, the Cause of Respiratory Disease. Reprinted from the Boston Medical and Surgical Journal. 15 pp.. 8vo. Boston, 1907.

United States of America. Index Catalogue of the Library of the Surgeon-General's Office, United States Army. Second Series, Vol. XII. 989 pp., 4to. Washington, 1907. *Surgeon-General, U.S. Army.*

Whitaker, *W., B.A., F.R.S.*, and **Barrow,** *G., F.G.S.* Some Well-sections in Middlesex. (From the "Summary of Progress of the Geological Survey of Great Britain" for 1906.) 31 pp., 8vo. London, 1907. *W. Whitaker, B.A., F.R.S.*

In addition to the Books presented to the Library, the following have been published in connection with Sanitary Science:—

Aitken, *Thomas, M.Inst.C.E.* Road-making and Maintenance: a Practical Treatise for Engineers, Surveyors, and others. London, 1907. Charles Griffin & Co., Ltd.

Burton-Fanning, *F. W., M.D.* The Open-Air Treatment of Pulmonary Tuberculosis. London, 1907. Cassell & Co., Ltd.

Cash, *C., B.A.* Our Slaughter-house System: a Plea for Reform. London, 1907. Geo. Bell & Sons.

Latham, *Arthur C., M.D., F.R.C.P.* The Diagnosis and Modern Treatment of Pulmonary Consumption. Third Edition. London: Baillière, Tindall, & Cox.

Manson, *Sir Patrick, K.C.M.G., M.D., LL.D.* Tropical Diseases: a Manual of Diseases of Warm Climates. Fourth Edition. London, 1907. Cassell & Co., Ltd.

Merriman, *M.* Elements of Sanitary Engineering. Third Edition. London, 1906. Chapman & Hall.

Morten, *Honor.* Health in the Home. London, 1907. James Clarke & Co.

Newman, *George, M.D.* The Health of the State. London, 1907. Headley Bros.

Schrotter, *Prof. Leopold Von.* Hygiene of the Lungs in Health and Disease. London, 1907. Rebman, Ltd.

Waldo, *F. J., M.A., M.D., D.P.H.* Golden Rules of Hygiene. Bristol, 1907. John Wright & Co.

Wanklyn, *J. Alfred, M.R.C.S.* Water Analysis: a Practical Treatise on the Examination of Potable Water. 11th edition. London, 1907. Kegan Paul, Trench, Trübner, & Co., Ltd.

LIST OF EXHIBITS ADDED TO THE MUSEUM.

Abattoir or Slaughterhouse Fittings. The "Locoril" hoist, with power gearing for one man to raise 30 cwt. The winding gear is checked automatically when the handle is released so that the handle cannot fly back. A separate handle acting on a screw disconnects the winding drum, and allows the load to be gradually lowered. Overhead rails and traveller, with switch for connecting or disconnecting branch rails. *Lockerbie & Wilkinson, Tipton, Staffs.*

Dust Bins. The "Vololo" pattern, made barrel shape, of corrugated steel, the corrugations being vertical, with flat or conical lids. Designed as a light receptacle not easily dented or crushed.
The Vololo Corrugated Steel Cask Co., Ltd., Norfolk Lane, Sheffield.

Interlocking Rubber Tiling for Flooring. Made of a rubber composition in slabs about 6 inches square and ¼ inch thick, so shaped as to make an interlocking joint with the adjoining tiles. Forming a soft and noiseless floor covering. *Anglo-American Rubber Co., 58, Holborn Viaduct.*

THE ROYAL SANITARY INSTITUTE.

REVIEWS OF BOOKS.

JENSEN'S MILK HYGIENE.*

A work on milk hygiene by a leading veterinary authority must be welcomed. The share which the veterinary profession in this country has taken with regard to the sanitary improvements in dairy farms has not been as full as it must be in the future. The book in question deals with the physiology of the cow; the variations in cow's milk as influenced by various physiological conditions, food, and environment; the changes which normally take place in milk and the changes which are the result of pathological conditions and bacterial contamination. The work in question cannot take the place of Swithinbank and Newman's classical work, and the medical officer and analyst have other sources of information which are not only more ample but more authoritative. It is a pity that Prof. Jensen has not dealt more fully with the practical work of milk production, so that the book would be of more use to the wholesale dairymen, managers of co-operative dairies, and others engaged in the trade. Now that it is likely that a standard for dirt will be set up in this country, the sections relating to the admixture of dirt with milk and the various standards for dirt which have been advocated are extremely interesting. It appears that the standards in Germany vary from 5 to 10 milligrams of dry dirt per litre. Apparatus is described for the estimation of dirt.

The best chapters in the book are those on the regulation of the production of milk and the regulation of the sale of milk. The description of the methods by which milk is sent by train in America in chilled cans is most suggestive. Rectangular cans are shewn which permit of easy handling and larger quantities of milk being sent in a given cubic space. Useful appendices are added on the regulations of various milk companies on the Continent and in America. Perhaps the most interesting matter in the appendix is the score card by which marks are allotted on the inspection of dairies by the Department of the Dairy Institute of the Cornell University. This is so much ahead of anything in this country that the card is well worth reproducing.

SCORE CARD FOR PRODUCTION OF SANITARY MILK.

Date................ Dairy of.................

		Perfect.	Score.
I. Health of the herd and its protection	Health and comfort of the cows, and their isolation when sick or at calving time	45	
	Location, lighting, and ventilation of the stable	35	
	Food and water	20	
	Total	100	

*Milk Hygiene, by C. O. Jensen, Professor of the Royal Veterinary College. Copenhagen. Translated by Leonard Pearson, Dean of the Veterinary Faculty of the University of Pennsylvania. 275 pp. Philadelphia and London, 1907. J. B. Lippincott Company. Price 7s. 6d. net.

II. Cleanliness of the cows and their surroundings	Cows	30
	Stable	20
	Barnyard and pasture	20
	Stable air (freedom from dust and odours)	30
	Total	100
III. Construction and care of the utensils	Construction of utensils and their cleansing and sterilising	40
	Water supply for cleaning, and location and protection of its source	25
	Care of utensils after cleaning	20
	Use of small-top milking pail	15
	Total	100
IV. Health of employés and manner of milking	Health of employee	45
	Clean overall milking suits, and milking with clean, dry hands	30
	Quiet milking, attention to cleanliness of the udder, and discarding fore milk	25
	Total	100
V. Handling the milk	Prompt and efficient cooling	35
	Handling milk in a sanitary room and holding it at a low temperature	35
	Protection during transportation to market	30
	Total	100
	Total of all scores	500

If the total of all scores is	And each division is	The sanitary conditions are
480 or above	90 or above	Excellent.
450 or above	80 or above	Good.
400 or above	60 or above	Medium.
Below 400	Or any division is below 60	Poor.

The sanitary conditions are.......... Scored by..........

The book does not contain many of those Americanisms which are so annoying to English readers. 'Capronic' and 'caprinic' acids are mentioned, and a desiccator is described as an "exsiccator." On euphemistic grounds this last should be hissed off. In printing, several slips have occurred in the formulæ (and, incidentally, it is questionable whether the great bulk of the chemical formulæ are not out of place in a work of this kind). On page 220 x is said to be equal to something $\times 100 \div 100$, and the same slip occurs on page 221. A new point is made, in that added water can be detected by discovering nitrates in milk. We read, "The presence of nitrates is positive. It must not be forgotten that when a milk can is rinsed a little water might be left, which, if it is rich in nitrates may cause the milk to show a slight reaction." On page 222 it is suggested that there should be no difficulty in detecting 10 per cent. of added water if the water contains 5 parts or more per 100,000 of nitric acid. A water which contained this quantity of nitrates would certainly not be fit to swill a milk can out with. On the whole the book is to be welcomed, and it is to be hoped that it will prove the forerunner of an English work dealing with the subject from the same point of view. S. B.

1.—REPORT OF THE BOARD OF HEALTH ON PLAGUE IN NEW SOUTH WALES, 1906.

2.—REPORT ON THE HISTORY OF PLAGUE IN BOMBAY, FROM 1896 TO 1907.

These reports are a valuable contribution to the etiology of plague, and are instructive, as they both are the outcome of a large practical experience.

Dr. Ashburton Thompson, in his report, deals with the sixth outbreak of this disease at Sydney, 1906. He gives abstracts of a large number of cases, arranged in the order of dates and notification, which exhibit the salient features and circumstances of each case. In his previous reports and writings Dr. Thompson has shown that his experiences at Sydney indicate that plague occurs independently of communication of the infected from the sick; that the infection of plague spreads by means which are external to man, and which are independent of his agency as subject of the disease; that the plague rat is harmless to man; nevertheless it is the essential cause of epidemics, consequently some intermediate agent is necessary to convey the infection from rat to man, and that the intermediate agent between rat and man, and between rat and rat, is no other than the flea, and actually is the flea.

Dr. Thompson states in the report under review, that the methods of prevention employed continued to be the same as in previous years. These, briefly stated, are the exclusion of rats from occupied buildings, which he regards as the most important step for the prevention of plague. Every building which is rendered inaccessible to rats may be regarded as a fortress impregnable to that enemy for ever. He regards this as the only road the sanitary administrators can fitly take.

Dr. Turner's report gives a history of plague in Bombay since it was first noticed, in August, 1896, and from which it has spread in all directions in India. The details of the methods adopted to control the epidemic in Bombay are given in detail. The work of the Plague Commission in India is summarised, and is followed by a resumé of the work done in the Health Department of the city, including the results of many investigations in the laboratory attached to the Department. Dr. Turner believes in disinfection, so as to kill fleas "and destroy bacilli recently deposited." He states that the dead infected flea, or the fæces of any infected flea, rubbed on the skin of an animal or man conveys the disease, either directly into the place where the flea has pricked on the skin or into an abraded surface or wound. As preventive measures Dr. Turner recommends disinfection, the removal of everything that will harbour rats, vacating the house and rendering it rat-proof. He acknowledges that making the house rat-proof and destroying rats are the most difficult.

The report is illustrated by maps showing the relation of epizootic and epidemic plague, and extending over eighteen months. Although they relate to only selected periods of one ward, they have an indirect bearing on the history of this disease in the city. This report is a very valuable contribution to the literature on the subject, and shows the extremely difficult task the health officers of the Municipality of Bombay have undertaken, to control the spread of plague and protect the native population in the poor and densely populated parts of the city. J. L. N.

1.—Report of the Board of Health on Plague in New South Wales (Sydney) 1906, by J. Ashburton Thompson, M.D., D.P.H., Chief Medical Officer of Government. 12 pp.

2.—Report on the History of Plague in Bombay, from 1896 to 1907, by J. A. Turner, M.B., D.P.H., Executive Health Officer.

MEETINGS HELD.

Sessional Meeting.

Manchester, December 13th. The meeting was held in the Municipal School of Technology, when a discussion on "Butter Supply," was opened by L. Wilson, Manager, Butter Department, Co-operative Wholesale Society, Manchester; and a discussion on "Small Dwellings" was opened by Prof. J. Radcliffe, M.Sc.Tech. The chair was taken by H. D. Searles Wood, F.R.I.B.A., Chairman of the Council of the Institute.

On Saturday, December 14th, visits were made to the Salford Corporation Model Lodging House and Artizans' Dwellings, and the Sewage Purification Works, under the guidance of Mr. J. Corbett, the Borough Engineer.

Examinations.

The following Examinations have been held :—

Sanitary Science as applied to Buildings and Public Works.

Manchester, Nov. 29th and 30th ...	3 candidates;	2 certificates granted.
London, Dec. 6th and 7th............	32 candidates;	8 certificates granted.

Inspectors of Nuisances.

Manchester, Nov. 29th and 30th ...	56 candidates;	24 certificates granted.
London, Dec. 6th and 7th	107 candidates;	54 certificates granted.

Hygiene in its bearing on School Life.

Manchester, Nov. 29th and 30th ...	6 candidates;	1 certificate granted.
London, Dec. 6th and 7th	10 candidates;	6 certificates granted.

Inspectors of Meat and other Foods.

London, Dec. 13th and 14th	37 candidates;	26 certificates granted.

Candidates who have received Certificates.

Sanitary Science as applied to Buildings and Public Works.

Baldwin, Ernest Wilfred.
Beech, Harry.
Brown, David James.
Butler, Stanley George Montague.
Jones, Arthur Edward.
Ling, Richard Bertram.
Moss, Sidney Robert.
Pritchard, Harold.
Wilson, Fred.
Winterbottom, Roland Hare.

Inspectors of Nuisances.

Abbott, Jerrold.
Agg, Alfred.
Allam, Harry.
Allin, Albert Victor.
Arnold, Percy George.
Barker, George S. E.

Barker, James Alcock.
Beken, Kenneth Stewart.
Bentley, Richard Francis.
Bible, Margaret.
Biggs, William Harry.
Blake, John Patrick.
Brodrick, Albinia Lucy.
Broker, Arthur William.
Brown, Alfred Battison.
Burgess, George Edward.
Burr, Percy Beard Frank.
Caplen, Leonard.
Casson, John.
Clay, Henry Hurrell.
Cohen, Edith.
Connolly, Margaret.
Cossens, Margery Elizabeth.
Coston, Mary Wall.
Deacon, Frederick James.
Dickinson, Harold.
Edser, William George.
Evans, Lillian.
Freeman, Ernest Charles.
Goodwin, Frederick Edmund.
Grant, Leonard Bishopp.
Green, Henry Charles.
Hamby, Charles Leopold.
Hancock, Harry.
Hughes, William Moulton.
Hughes, William Owen.
Hunt, Charles Frank.
Ingham, James Walton.
Jackson, Hubert St. John.
Jenner, Albert James.
Jennings, Charles Percival Barlow.
Kinnison, Helen.
Langford, Francis Charles.
Laycock, Robert.
Leeke, John.
Lees, Randle Burslam.
Macleod, Ina.
May, Philip George.
Monkhouse, Mary.
Moore, Edward George.
Napier, Henry Anderson.
Naylor, George William.
Oborn, Alfred John.
Oborn, Stanley Mill.
Perry, Alice Jacqueline.
Phillips, Henry Charles.
Pike, George Wilfrid.
Pitts, Charles.
Rampling, George Harry.
Randall, George Walker.
Reynolds, Frederick.
Reynolds, Harold Walter.
Rishton, Alice.
Rutter, Robert.
Saunders, Richard.
St. Stephens, Nora.
Schofield, Frank.
Smith, George Edward.
Smith, William Edward.
Townsend, Edward Aldridge.
Virtue, Isabel.
Walker, Harry.
Walker, Joseph.
Waterhouse, Arthur A.
Whorwell, John George Bromley.
Wilson, Mary.
Wilshire, Arthur James.
Yates, Mona.

Hygiene in its Bearing on School Life.

Crawford, Samuel Hugh.
Davies, Marian Gwyneth.
Joseph, Aimée Beatrice.
Nesbit, Anthonia Zara Nisbeth.
McCluskie, Margaret E.
Skinner, Arthur.
Taylor, Evelyn Beatrice Charlotte.

Inspectors of Meat and other Foods.

Bellamy, Page William.
Bernard, William Kingsmill, *Capt.*, *A.S.C.*
Black, John Campbell Lamont, *Major*, *A.S.C.*
Bramhall, Edward Albert, *Lt.-Col.*, *A.S.C.*
Bridel, George James.
Broom, George, *M.R.C.V.S.*
Canham, Charles Edward Lewis.
Cardew, George Hereward, *Lt.-Col.*, *A.S.C.*
Cobbett, Arthur William.
Crowther, Joe.
Davies, Percy Matcham, *Major*, *A.S.C.*
Fulker, Frederick Francis.
Gray, Arthur Herbert.
Harman, Albert George.
Hyde, Howard Light.
Jenkins, John James.
Kent, Arthur.
Lord, John.
Parker, St. John W., *Lt.-Col.*, *A.S.C.*
Pearson, John Henry.
Pidwell, Engall Thomas.
Priest, Alfred.
Shelley, Samuel Philip.
Sykes, Francis.
Thomas, Milton Mason.
Townsend, Alfred Charles.

FORTHCOMING MEETINGS.

Congress and Exhibition, 1908.

The Congress will be held at Cardiff, July 13th to 18th, under the presidency of the Rt. Hon. the Earl of Plymouth, C.B., P.C., D.L., J.P., Lord-Lieutenant of Glamorganshire.

Lecture to the Institute.

"The Results of Sanitation in the Efficiency of Armies in Peace and War," by Surgeon-General Sir Arthur Keogh, K.C.B., M.D., LL.D., Director-General, Army Medical Service, on a date to be fixed about the last week in February.

Sessional Meetings.

London, Wednesday, February 12th. Discussion on "Rivers Pollution, with special reference to the Board proposed by the Royal Commission," to be opened by Sir William Ramsay, K.C.B., LL.D., D.Sc., Ph.D., F.R.S. The chair will be taken at 8 p.m. by Sir Alexander R. Binnie, M.Inst.C.E., Vice-President of the Institute.

It is proposed to arrange for Provincial Sessional Meetings in 1908, in the following towns:—Hereford, Durham, Coventry or Birmingham, Shrewsbury, Hull, York, Nottingham, Belfast, and Exeter.

Blackpool, March 13th and 14th.

London Sessional Meetings will also be held in April and May.

Examinations.

In Sanitary Science as applied to Buildings and Public Works,
For Inspectors of Nuisances, and
In Hygiene in its Bearing on School Life—
Plymouth, January 24th and 25th.

Inspectors of Meat and other Foods—
Glasgow, February 7th and 8th.

LECTURES.

The 45th Course of Lectures and Demonstrations for Sanitary Officers will commence on February 17th.

The 12th Course of Practical Instruction in Meat Inspection will commence on February 21st.

Course of Lectures on Sanitary Science as applied to Buildings and Public Works, will commence on March 4th.

The Special Course on Food and Meat Inspection, arranged for Army Officers and Professional Men, will commence on April 27th.

Course of Lectures on Hygiene in its bearing on School Life, for School Teachers, will commence on March 2nd.

CALENDAR, JANUARY AND FEBRUARY, 1908.

As far as at present arranged.

Council and Committee Meetings are suspended during August and September, and the Museum and Library are closed on Public Holidays.

The Parkes Museum is open free, on Mondays 9.30 a.m. to 8 p.m., other days 9.30 a.m. to 5.30 p.m. The Library and Office are closed at 1 p.m. on Saturdays.

JANUARY.

24 F. / 25 S. Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Plymouth.

25 S. Public Meeting *re* Congress at Cardiff.

FEBRUARY.

7 F. / 8 S. Examination for Inspectors of Meat and other Foods, Glasgow.

12 W. **Sessional Meeting,** LONDON, at 8 p.m. Discussion on "Rivers Pollution, with special reference to the Board proposed by the Royal Commission," to be opened by Sir William Ramsay, K.C.B., LL.D., D.SC., PH.D., F.R.S.

17 M. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, A: Introductory Remarks, Public Health Acts—English, Scotch, Irish; other Statutes relating to Public Health; By-laws (Model, etc.), Regulations, Orders, Memoranda, etc., by J. Priestley, B.A., M.D., M.R.C.S., D.P.H., M.O.H. Lambeth.

19 W. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, B: Public Health (London) Act; Metropolis Local Management Acts; By-laws and Regulations in force in the Administrative County of London, by J. Priestley, B.A., M.D., M.R.C.S., D.P.H.

21 F. Lecture to Sanitary Officers at 7 p.m. Sanitary Law, C: Factory and Workshop Acts (including Bakehouse Legislation, 1878–95) as they affect the Sanitary Inspector; Smoke Legislation; Food and Drugs Acts, 1899, by J. Priestley, B.A., M.D., M.R.C.S., D.P.H.

21 F. Lecture—Meat Inspectors' Course, at 6.30 p.m.

21 F. / 22 S. Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Hull.

24 M. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General, A: Outdoor, by A. Wellesley Harris, M.R.C.S., D.P.H., M.O.H., Lewisham.

25 T. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—General, B: Indoor, by A. Wellesley Harris, M.R.C.S., D.P.H.

26 W. Inspection and Demonstration in the District of Islington, at 2 p.m. (number limited). Conducted by James R Leggatt, Supt., Public Health Dept., Borough of Islington.

27 Th. Demonstration of Book-keeping as carried out in a Sanitary Inspector's Office, at the Public Health Office, Town Hall, Upper Street, Islington, N., at 7 p.m., by James R. Leggatt, Supt., Public Health Department, Borough of Islington.

28 F. Lecture to Sanitary Officers at 7 p.m. Duties of a Sanitary Inspector—C: Offensive Trades and Trade Nuisances, etc., by A. Wellesley Harris, M.R.C.S., D.P.H.

28 F. }
29 S. } Examinations in Sanitary Science as applied to Buildings and Public Works, for Inspectors of Nuisances, and in Hygiene in its bearing on School Life, Blackburn.

29 S. Demonstration—Meat Inspectors' Course, at 2 p.m.

29 S. Inspection and Demonstration in the District of Chiswick, at 3 p.m. Conducted by J. H. Clarke, Chief Sanitary Inspector.

MARCH.

24. Tu. **Annual Meeting of Associates,** at 8 p.m.

APRIL.

15 W. **Ordinary General Meeting,** at 4.30 p.m.

JULY.

13—18 **Congress and Exhibition, Cardiff.**

LIST OF FELLOWS, MEMBERS AND ASSOCIATES ELECTED,

DECEMBER, 1907.

† Marked thus have passed the Examination of the Institute for Local Surveyors.
‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

FELLOWS.

Reg. No.		
671	1907. Dec.	BROWN, Arthur, M.INST.C.E., *City Engineer, Guildhall, Nottingham.*
607	1907. Dec.	CHART, Robert Masters, F.S.I., *Mitcham, Surrey.*
2354	1907. Dec.	HEREFORD, RIGHT REV. THE LORD BISHOP OF (J. Percival, D.D.), *The Palace, Hereford.*
2057	1907. Dec.	HEWLETT, Richard Tanner, M.D., M.B., F.R.C.P., M.R.C.S., D.P.H., *Director of the Public Health Laboratories, King's College, W.C.*
2060	1907. Dec.	LACHAPELLE, E. P., M.D., *Laval University, Montreal.*
1322	1907. Dec.	McCLEARY, George Frederick, B.A., M.D., D.P.H.LOND. & CANTAB., L.S.A., 7, *Belsize Park Gardens, Hampstead, N.W.*
1809	1907. Dec.	MACMORRAN, Alexander, M.A., K.C., ASSOC.INST.C.E., 3, *Temple Gardens, Temple, E.C.*
2027	1907. Dec.	MONTIZAMBERT, Frederick I.S.O., M.D., F.R.C.S.E., D.C.L., *Director-General of Public Health, Ottawa, Canada.*

238 1907. Dec. Pullar, Sir Robert, M.P., J.P., F.R.S.E., *Tayside, Perth, N.B.*

330 1907. Dec. †‡Radcliffe, Joseph, M.SC.TECH., F.R.MET.SOC., *Municipal School of Technology, Sackville Street, Manchester.*

1919 1907. Dec. Sumner, Frank, M.INST.C.E., *Sola Villa, Highland Road, Bromley, Kent.*

1888 1907. Dec. Turner, John Andrew, M.B., C.M., D.P.H., *Health Department, Bombay, India.*

MEMBERS.

* Marked thus have passed the Examination of the Institute in Sanitary Science as applied to Buildings and Public Works.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

2343 1907. Dec. Ball, Charles Backus, MEM.AM.SOC.C.E., *Chief Sanitary Inspector, Chicago, Illinois, U.S.A.*

2344 1907. Dec. Barber, J. Patten, M.INST.C.E., *Borough Engineer and Surveyor, Town Hall, Upper St., Islington, N.*

2345 1907. Dec. Collin, W. H., *Assistant Architect to the Local Government Board, Whitehall, S.W.*

2346 1907. Dec. Cronin, John J., A.B., M.D., *Assistant Chief Medical Inspector, Dept. of Health, New York City, U.S.A.*

2347 1907. Dec. Davies, Ernest George, M.S.A., 7, *Bridge Street, Hereford, (and Monmouth).*

2348 1907. Dec. Dunsmore, Gilbert, P.A.S.I., 1, *Garthorne Road, Honor Oak Park, S.E.*

2349 1907. Dec. Fawcus, Capt. Harold B., R.A.M.C., M.B., B.S.DURH., D.P.H.CAMB., *Royal Army Medical College, Millbank, S.W.*

2350 1907. Dec. Griffith, Percy, M.INST.C.E., M.I.MECH.E., F.G.S., 54, *Parliament Street, Westminster, S.W.*

2351 1907. Dec. Gulick, Luther H., M.D., 500, *Park Avenue, New York City, U.S.A.*

2352 1907. Dec. Hawkins, John Frederick, *County Surveyor of Berkshire, Bank Chambers, Cross Street, Reading.*

2353 1907. Dec. Haynes, Henry Thomas, ASSOC.M.INST.C.E., *City Engineer, Perth, Western Australia.*

2355 1907. Dec. Kitchin, Brook Taylor, F.R.I.B.A., *Local Government Board, Whitehall, S.W.*

2356 1907. Dec. Lewis, Frederick William, M.B.LOND., D.P.H.LOND., 9, *Foulden Road, Stoke Newington, N.*

2357 1907. Dec. Pearse, Major Albert, R.A.M.C., M.R.C.S., L.R.C.P., D.P.H., *Freetown, Sierra Leone, West Africa.*

2358 1907. Dec. Pearson, Harry John, F.S.I., A.R.I.B.A., *St. Stephen's House, Westminster, S.W.*

2359 1907. Dec. PENN-SIMKINS, George, LIC.C E., *Executive Engineer, P.W.D., Lacca, E. Bengal, India.*

2360 1907. Dec. PITE, William Alfred, F.R.I.B.A., 116, *Jermyn St., St. James's, S.W.*

2367 1907. Dec. *REES, Alfred Edward, *Housing Dept., L.C.C.*, 23, *Cockspur Street, S.W.*

2361 1907. Dec. ROYLE, Fred Murray, ASSOC.M.INST.C.E., *Milton Chambers, Milton Street, Nottingham.*

2368 1907. Dec. *SMITH, Roland Ingleby, M.S.A., 47, *Freemantle Rd., Cotham, Bristol.*

2363 1907. Dec. TANNER, Henry, Jnr., F.R.I.B.A., 12, *Regent Street, S.W.*

2362 1907. Dec. TELFORD-SMITH, T., M.A., M.D., B.CH., D.P.H., *(M.O.H.), Romansleigh, Wimborne, Dorset.*

2364 1907. Dec. TROTMAN, Samuel Russell, M.A., F.I.C., *City Analyst*, 1, *Regent Street, Nottingham.*

2366 1907. Dec. WORSLEY, Arthur Henry, A.R.I.B.A., *St. Stephen's House, Westminster, S.W.*

2365 1907. Dec. WRIGHT, Charles Panton Farie, M.C.E., *Flinders Buildings*, 312, *Flinders Street, Melbourne, Victoria, Australia.*

ASSOCIATES.

‡ Marked thus have passed the Examination of the Institute for Inspectors of Nuisances.

***S* Marked thus have passed the Examination of the Institute in Hygiene in its bearing on School Life.**

4284 1907. Dec. ‡ALVES, Harold Norman, 21, *Norbins Road, Glastonbury, Somerset.*

4285 1907. Dec. ‡BEST, Alfred Thomas, ASSOC.M.INST.C.E., 3, *Bulwark, Brecon, Breconshire.*

4298 1895. Jan. ‡BEVERIDGE, J. M., 151, *Harrow Road, W.*

4286 1907. Dec. ‡CAVE, Daniel Walter, *The Wegnalls, Leominster.*

4287 1907. Dec. ‡FORTUNE, Sidney Herbert, P.A.S.I., *Hankley Villa, Oldfield Park, Bath, Somerset.*

4288 1907. Dec. ‡HINDE, Charles, 19, *St. Ambrose Grove, Anfield, Liverpool.*

4289 1907. Dec. ‡HUTTON, E. Harry, 25, *Chesnut Road, Plumstead.*

4291 1907. Dec. *S* LINDSAY, Miss Jean R., 18, *Ormidale Terrace, Murrayfield, Edinburgh.*

4292 1907. Dec. ‡LOVELL, Harold Brimble, 43, *Picton Street, Montpelier, Bristol.*

4293 1907. Dec. ‡MASKERY, WILLIAM, *Homeleigh, Watchetts Road, Camberley.*

4290 1907. Dec. ‡MATTICK, Alan Walter George, *Radstock, Somerset.*

4293 1907. Dec. ‡MUCKLE, Robert, 132, *High Street, Langley Moor, Durham.*

4294 1907. Dec. ‡OWEN, Richard E., 27, *Chapel Street, Portmadoc, Carnarvon.*

4295 1907. Dec. ‡PALLISTER, William John, *Alexandra Street, Shildon, Durham.*

4296 1907. Dec. ‡RAINE, William Stephenson, *High Street, Eddington, Hungerford, Berkshire.*

4297 1907. Dec. ‡ROBERTSON, John D., *Tomlunquhart, Nairn, N.B.*

4282 1907. Dec. VERNEY, Sir Edmund, Bart., *Claydon House, Steeple Claydon S.O., Buckinghamshire.*

THE FOLLOWING JOURNALS AND PERIODICALS HAVE BEEN RECEIVED IN THE LIBRARY DURING 1907.

WEEKLY.

British Architect.
British Medical Journal.
Builder.
Builders' Journal and Architectural Engineer.
Contract Journal.
Domestic Engineering.
Engineering.
Hardware Trades Journal, The.
Health.
Indian Engineering.
Journal d'Hygiène.
Journal of the Society of Arts.
Lancet.
Local Government Chronicle.
Local Government Journal.
Local Government Officer.
London County Council Gazette.
Municipal Journal.
British Journal of Nursing.
Sanitarisch-demographisches Wochenbulletin der Schweiz.
Sanitary Record.
Surveyor and Municipal and County Engineer.
Universal Provider.
Veterinary Record.
" News.

MONTHLY, Etc.

Annales des Ponts et Chaussées.
Architect's Magazine.
British Journal of Inebriety.
British Journal of Tuberculosis.
Bulletin du service de Santé et de l'Hygiène publique (Bruxelles).
Bulletin de la Société des Ingénieurs et Architectes Sanitaires de France.
Canadian Nurse.
Chicago Health Bulletin.
Concrete.
Deutsche Vierteljahrsschrift für öffentliche Gesundheitspflege.
Direzione Generale dell' Amministrazione Civile. Bollettino Sanitario.
Engineering Magazine.
Giornale della Reale Società Italiana d'Igiene.
Glasgow Medical Journal.
Iowa Health Bulletin.
Journal of Hygiene.
Journal of the American Public Health Association.
Journal of the Institute of Sanitary Engineers.
Journal of the Royal Institute of British Architects.
Journal of the Royal Meteorological Society.
Journal of the Royal Statistical Society.
Journal of the Sanitary Inspectors' Association.

Journal of Preventive Medicine.
La Ingenieria.
La Salute Pubblica (Perugia).
La Technologie Sanitaire.
Le Génie Sanitaire.
Le Mois Medico-Chirurgical.
Medical Magazine.
Meteorological Record.
Museums Journal, The.
New York State Board of Health, Monthly Bulletin.
North of England Institute of Mining Engineers' Transactions.
Plumber and Decorator.
Proceedings of the Society for the Study of Inebriety.
Public Health.
Registrar-General's Returns: England and Wales, Scotland, and Ireland. Weekly, Monthly, and Quarterly.
Revue d'Hygiène et de Police Sanitaire.
Royal Engineers' Journal.
Sei-i-Kwai Medical Journal.
Société d'Hygiène de l'Enfance Bulletin Mensuel.
Surveyors' Institution, Transactions of.
Symons's Meteorological Magazine.
Tablettes Mensuelles de la Société Royale de Médecine publique.
Technology Quarterly and Proceedings of the Society of Arts (Massachusetts).
Water.

EXHIBITION OF SCHOOL BUILDING AND FURNISHING APPLIANCES, LONDON, 1907.

ADDITIONAL AWARD FOR EXHIBIT SELECTED FOR FURTHER TRIAL.

BRONZE MEDAL.

JOHN JONES (CHELSEA), LTD.
Anti-Flooding Valve with Screened Float Chamber.

EXHIBITS FOR WHICH MEDALS HAVE BEEN AWARDED AT THE SCHOOL BUILDING AND FURNISHING APPLIANCES EXHIBITION, 1907.

Portable School Pavilion.

Silver Medal.

To Christoph & Unmack.

This Sectional Portable School Building comprises two class-rooms, a room for the medical adviser, and an entrance hall or corridor. It is constructed of ready-made sections which are connected by a simple method of hooks, no nails or screws being used, enabling the buildings to be transported as often as necessary without loss or damage of the materials. The wall sections are formed by wooden frames covered outside with boards overlapping each other, and inside with Doecker's water, fire, and acid proof material, thus forming hollow spaces which act as non-conductors, improved in most cases by the addition of other isolating material.

Sizes.—About 72 ft. 8 in. long by 28 ft. 6 in. wide, 11 ft. 6 in. high to eaves, 16 ft. 5 in. high to ridge.

Price.—£825.

Manufactured by Christoph & Unmack, Ltd., Niesky, Germany.

Lead-covered Steel Glazing Bar.

Bronze Medal.

To THE BRITISH CHALLENGE GLAZING Co., LTD.

Tee Steel Bar (with table upwards) covered with a clothing of pure lead throughout, and is drawn in one piece without joint, which makes it impossible for moisture to get to the tee bar. A special feature is that the wings are joined in the centre lead core below the level of the glass, to prevent the working of this joint in dressing down the wings on to the glass.

An illustration of this appliance was given in the Supplement to Vol. XXVII. of the Journal, page 198.

Manufactured by THE BRITISH CHALLENGE GLAZING Co., LTD., 92, Tooley Street, S.E.

Eaves Gutter.

Bronze Medal.

To PRYKE & PALMER.

By the simple method of casting three iron wedges or flanges on the back of the ordinary O. G. it raises the front, so that when fixed it has the capacity of a moulded gutter at very considerably less cost, also effecting an improvement in fixing over the ordinary O. G. gutter.

SIZES.— 3½, 4, 4½, 5, 6 inches.

PRICES.—11½d., 1s., 1s. 1d., 1s. 3d., 1s. 7d. per yard in 6 ft. lengths.

Manufactured by PRYKE & PALMER, 40, 41, Upper Thames St., London, E.C.

Improved Overflow Lavatory.

Silver Medal.

To DUCKETT & SONS.

The "Overflow" Lavatory Basin, constructed to provide a continuous stream of water to facilitate the children washing at school, and to provide each child with clean water without undue waste.

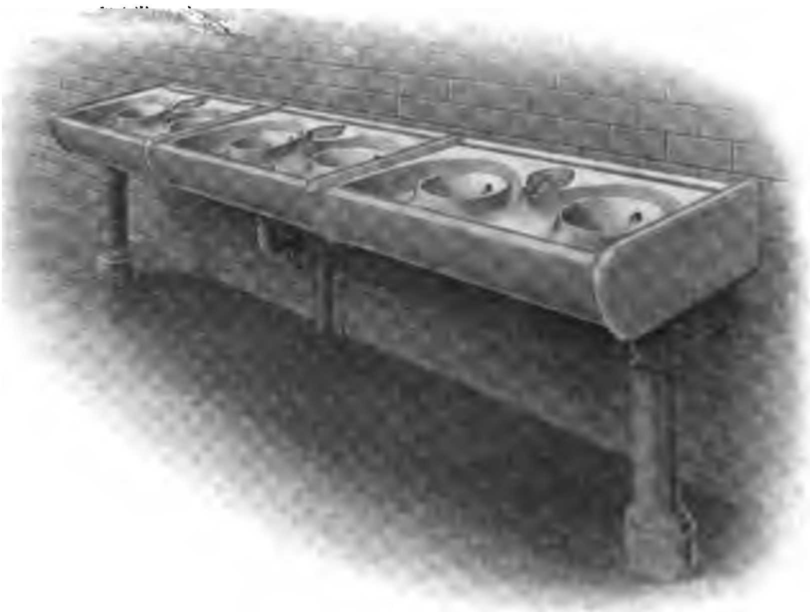
PRICE.—Range for two persons, in cane and white ware, £4 7s.

Manufactured by J. DUCKETT & SONS, LTD., Burnley.

"Clarifont" Wash Basin.

Silver Medal.

To W. Cassels.



The form is that of a basin within a basin or trough to catch the overflow and splashes. The water is turned on to the range of basins at stated times, *e.g.*, before the drawing or sewing classes, and it overflows all round the rim of the basin, providing against any germs or soapy scum adhering to the sides. By having the basin just large enough to immerse the hands the minimum of water is required to replace the soiled water, and a greater number can wash in less time and use less water than with ordinary basins. Owing to its size there is no waiting for the basin to fill, and students can succeed each other without loss of time and each have clean water. An end basin in a range may have an independent tap.

Sizes.—13 in. and 15 in. centres. Also in larger sizes for adults.

Prices.—£1 16s. and £2.

Manufactured by Wm. Cassels, Park Place, Stirling, Scotland.

Pedal Spray Lavatory.

Bronze Medal.

To John Jones (Chelsea), Ltd.

Pedal Spray lavatory having treadle action, valve for cold or tepid supply to copper rose for hand washing, and also flushing rim to cleanse basin. Specially made for isolation wards of hospitals, giving a self-cleansing basin with treadle action supply.

Price.—£3 10s.

Manufactured by John Jones (Chelsea), Ltd.

Earth Closet.

Silver Medal.

To The British Sanitary Co.

The Mechanism is bushed with brass, so as not to corrode.

Prices from £2 7s. 6d. to £6 6s.

Manufactured by The British Sanitary Co., 341, Bath Lane, Glasgow.

"Kingston" Corbel Closet, with radial joint.

Bronze Medal.

To J. Duckett & Sons.

The "Kingston" Corbel w.c., fitted with Debney's patent radial jointed outlet trap, supported on brackets fixed to wall to render closet floor free from obstruction.

Prices on application.

Manufactured by J. Duckett & Sons, Ltd., Burnley.

"Infanta" Closet for Girls.

Bronze Medal.

To The Leeds Fireclay Co.

This Closet has been specially designed for use in Schools. The rim is formed to throw all moisture into the pan, and the side outlet gives a minimum projection into the compartment.

Price per Suite, £2 19s.

Manufactured by Messrs. Oates & Green, Ltd. (Branch of Leeds Fireclay Co.)

The Gravitation System of Water Supply to Closets.

Bronze Medal.

To John Jones (Chelsea), Ltd.

Gravitation Water Supply applied to ranges of closets for schools, barracks, &c. Only one ball valve is used to supply tank, which can be fixed inside or outside latrine building; and instead of slow process of filling each flushing cistern through separate valves, immediately any of the flushing cisterns are discharged it refills under gravitation supply.

Prices in particulars for applying this system to old ranges of water-closets, or for complete ranges of fittings.

Manufactured by John Jones (Chelsea), Ltd.

"Taper" Type Urinal.
Bronze Medal.

TO THE LEEDS FIRECLAY CO.

By the Patent Taper Back the flush from the supply pipes is concentrated, so that at every discharge of the cistern the urinals may be washed clean all over. Joints are out of reach of urine, and the back and channel are made in one piece. No hidden or concealed channels. All parts open for inspection. Constructed of highly glazed heavy fireclay back, sole, channel and pier in one piece; glazed ware moulded capping, tiled panelled floor treads, outlet trap and brass hinged grating, glazed ware automatic flushing cistern and glazed ware brackets, and polished copper flushing pipes.

4 ft. 1½ in. high, and 4 ft. 10 in. high; 2 ft. centres.

PRICES for best white glazed ware, 4 ft. 1½ in. high.

For 1 person	..	£7	15	0		For 4 persons	..	£28	12	6
„ 2 persons	..	14	5	0		„ 5 „	..	34	12	6
„ 3 „	..	21	10	0		„ 6 „	..	40	15	0

These prices are subject to 7½ per cent. advance.

Manufactured by MESSRS. OATES & GREEN, LTD. (Branch of Leeds Fireclay Co.)

Single School Urinal and Automatic Flushing Cistern.

Bronze Medal.

To John Jones (Chelsea), Ltd.

Buff-glazed Fireclay Single-stall Urinal in one piece, with distributing flush pipe and spreader, automatic flushing cistern and brackets complete. Also made in ranges.

Sizes.—Centres, 1 ft. 11½ in.; height, 3 ft. 4 in.

Price.—£4 16s.

Manufactured by John Jones (Chelsea), Ltd.

"Solent" School Urinal Range for three persons.

Bronze Medal.

To J. Duckett & Sons..

The "Solent" School Urinal, with backs and soles in one piece of ware, continuous open channel, and vertical lipped backs.

Price.—Range for two persons, in cane or amber ware, £9 5s.

Manufactured by J. Duckett & Sons, Ltd., Burnley.

Slab Urinals, with rounded internal corners.

Bronze Medal.

To J. Duckett & Sons.

The "Solway" Slab Urinals, of backs and divisions with rounded corners, in one piece of ware and continuous open channel.

Price.—Range for two persons, in cane or amber ware, £9 2s. 6d.

Manufactured by J. Duckett & Sons, Ltd., Burnley.

Steel Enamelled Bath, on wheeled cradle.

Bronze Medal.

To Pryke & Palmer.

Sizes.—Extreme length, top 6 ft., bottom 4 ft. 4 in.; extreme width, top 2 ft. 6 in., bottom 1 ft. 8 in.: inside width, top 2 ft. 1 in., bottom 1 ft. 5 in.; depth, 1 ft. 8 in. Note the weight, bath 100 lbs., cradle 50 lbs.

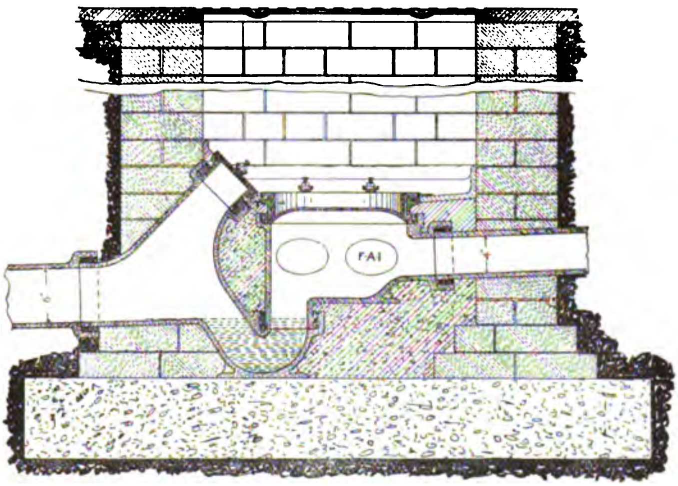
Price.—£10 10s.

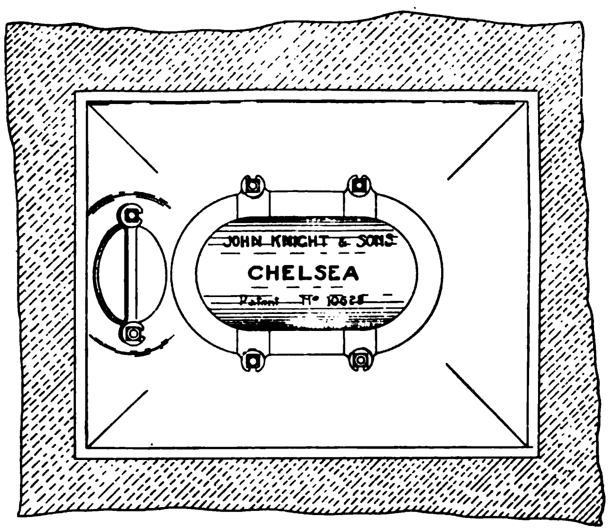
Manufactured by Pryke & Palmer, 40, Upper Thames Street, E.C.

Combined Stoneware and Cast-iron Drain Fittings.

Silver Medal.

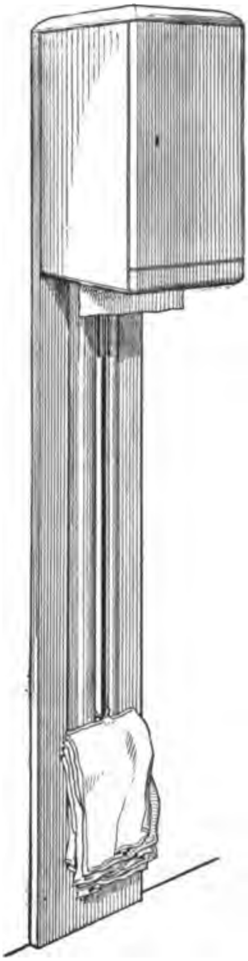
To John Knight & Sons.





Various Stoneware Pipes and Traps, with detachable covers and fittings in cast iron.

Manufactured by John Knight & Sons, Patentees, 24, Gertrude Street, Chelsea, S.W.



Towel Distributor.

Bronze Medal.

To W. Cassels.

The "One Each" Towel Distributor provides a clean towel to each scholar. It can be fixed to a wall or screen, and holds about 150 towels which are just large enough to efficiently dry the hands. The towels are attached to a brass rod at back by sliding rings, the free end of bottom towel hanging through an opening in bottom of box within easy reach of a child's hand. Only one towel can be withdrawn at a time, and after use it is allowed to drop to lower end of brass rod, where the soiled towels hang until the box needs replenishing. The towels cannot be taken away or mislaid. The folding down of the lid of box fixes the brass rod in its position, and the closing of door bolts the lid, so that the interior of box is inaccessible without the key. The rings can be detached from the towels for the greater convenience at the laundry, but cannot be detached while in the distributor.

Price, in yellow pine, with brass rod, £2 each. Towels, including brass rings, £1 7s. 6d. per hundred.

Manufactured by Wm. Cassels, Park Place, Stirling.

Steel self-contained Cloak Room Fittings.

Bronze Medal.

To The "England" Works.

The "England" Patent Steel Self-contained Cloakroom Fitting, can be adapted to all conditions of buildings. The coat hooks are adjustable, and can be fixed at any desired distance apart. Supplied with heating coil for drying purposes and lockers. Coated with pure aluminium. 25 persons accommodated per square yard of floor area.

Size.—Made in ranges of any length and width to suit requirements.

Price.—From 2s. 6d. per accommodation.

Manufactured by The "England" Works, Leeds.

Patent "Heaped" Fireplace in Glazed Earthenware.

Bronze Medal.

To Bratt, Colbran, & Co.

Glazed Briquette Fireplace, fitted with "Heaped" fire and wood shelf, and with tile hearth and cast-iron or glazed earthenware kerb. Can be made with any size fire, and to any height and width overall.

Size.—30 in. × 42 in. 12 in. fire.

Price.—£4 12s. 6d.

Manufactured by Bratt, Colbran, & Co., 10, Mortimer St., London, W.

Glazed Faience "Devon" Fireplaces.

Bronze Medal.

To Candy & Co.

Glazed Faience Fireplace, with faience shelf, 12 in. "Devon" Fire, 6 × 2 raised briquette hearth, and segmental faience curb complete.

Sizes.—24 in. wide × 38 in. high; width of shelf, 28 in.

Price.—£2 12s. 6d.

Manufactured by Candy & Co., Ltd., 87, Newman Street, Oxford Street, London, W. Works:—Heathfield Station, near Newton Abbot, South Devon.

Stumpf Reform Sash Window.

Bronze Medal.

To Hasserodt & Co.

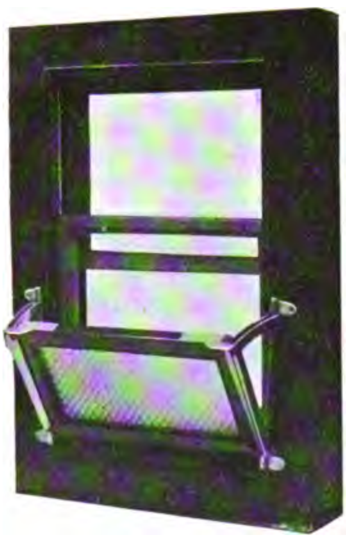
D.R.P. Nr 128824.

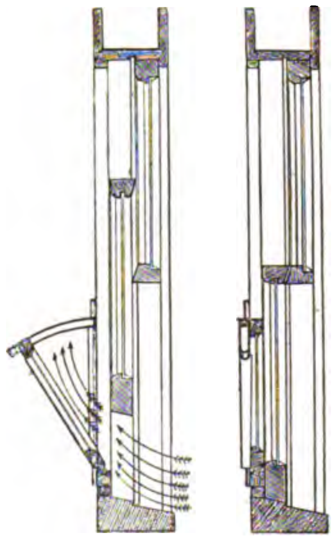
Stumpf's Reform Sliding Window is constructed so as to represent a hermetically closing window in two parts placed one above the other. The two sashes are balanced by counter-weights; they are easily movable and remain stationary in any position required, thus facilitating excellent ventilation either at the top, or at the bottom, or on both ends combined. Ventilation can be obtained by turning the lower sash down to the catch bolt and lowering the upper sash a little, whereby a circulation of air is established around the upper sash. The window can be cleaned from the floor by turning each sash down into the room.

Collapsible Hopper.

Bronze Medal.

To C. C. Ventilator Co.





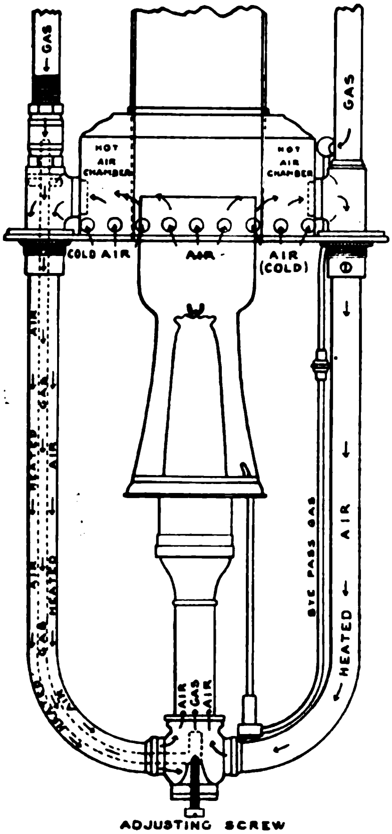
The Ventilator is specially adapted for sliding sashes, and can be easily applied to existing or new sash frames. The fresh air is admitted at the bottom, and striking against the inside of ventilator is driven upwards. The front portion of ventilator can be taken out for cleaning or other purposes. The side wings are so constructed that they lie parallel and close against front of ventilator when closed, and do not interfere with the blinds. The ventilator is formed in three parts. The centre portion, which is a wood frame fitting between beads of sash frame and connected to same by pins and slots, is glazed with either plain or Muranese glass and takes the place of a screen. It lies loose on a rule joint principle in a hollow channel, which is screwed on to bead of sash sill. This channel piece is provided with drip holes, which carry away any water from channel out on to window sill. When the screen or frame is closed it is kept in position by two ball catches, one on each side of frame. The frame has also two roller plates, one at either end of top rail, and which connect same with side wings. The side wings are of wrought steel or other metal, and are glazed with plain glass; they are hinged and screwed on to face of sash frame, and have a groove on same to admit of roller in connection with centre portion, so that in drawing forward or closing the whole works automatically together.

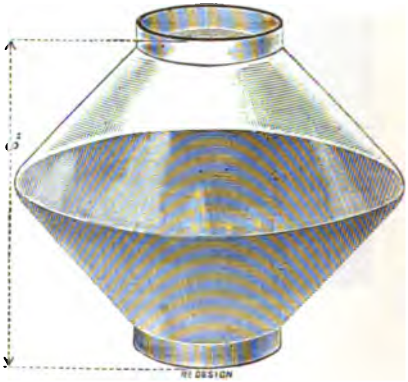
Manufactured by The C. C. Ventilator Co., Liverpool.

Dust-proof Bunsen Burner Intensifying Lamp.

Bronze Medal.

To A. E. Podmore & Co.





Dust-proof Bunsen Burner Intensive Lamp, specially suited for school purposes and dusty positions.

Reversible opal and flint globes, for school lighting to protect the eyes from glare of light.

Various sizes.

Manufactured by A. E. Podmore & Co.

"Farringdon" Adjustable Desk.

Bronze Medal.

To the Educational Supply Association.

This desk is so designed that both desk and seat can be adjusted to suit pupils of any height, and it will be found most useful when the ages of the pupils in a form or class vary to any considerable extent. The movements for adjusting the heights are contained in the uprights of the seat and desk respectively; the uprights, including the adjustable movements, being made of iron. The movements work automatically and there are no springs to get out of order. The variations in the height of the desk are at intervals of one inch, and of the seat at intervals of three-quarters of an inch. The seat is specially shaped, being deeply saddled and inclined slightly backwards. Each desk is provided with a locker which slides backwards and forwards, and allows the edge of the desk, when used for writing, to project slightly over the seat, providing at the same time ample space for the pupil when reading or studying. Two turn buttons are provided in the locker so that the lid may be used flat as well as sloping. The footrail is adjustable horizontally in three positions. Each desk is provided with two rollers, which enable it to be easily moved.

Desk No. 0142.—Fitted with Improved Adjustable Back, in three sizes. Strongly made with dovetailed corners; lockers made of best Pitch Pine, American Whitewood, or Oak; seat of Beech.

Large Size.—Length of top, 23 in.; width, 19 in.; fitted with large chair seat deeply saddled and inclined slightly backwards; and extra high backiron fitted with backrail and pad, both of which are adjustable, the iron upright being curved at the bottom. Heights of desk, adjustable from 27 in. to 32 in. at intervals of 1 in. Heights of seat, adjustable from 17 in. to $20\frac{3}{4}$ in. at intervals of $\frac{3}{4}$ of an in. Floor space, 35 in. to 40 in.

Medium Size.—All measurements as above, excepting that the chair seat is smaller, and the backiron is not so high. Floor space, 33 in. to 37 in.

Small Size.—Length of top, 21 in.; width, 18 in.; fitted with small chair seat and backiron. Heights of desk, adjustable from 23 in. to 28 in. at intervals of 1 in. Heights of seat, adjustable from 14 in. to $17\frac{3}{4}$ in. at intervals of $\frac{3}{4}$ of an in. Floor space, 29 in. to 33 in.

Prices, including staining and varnishing:

		Large size.			*Medium size.*			*Small size.*		
		£	s.	d.	£	s.	d.	£	s.	d.
Pitch pine	per desk	2	2	6	2	2	0	2	0	0
American whitewood (stained any colour)	„	2	4	6	2	4	0	2	2	0
Oak	„	2	5	6	2	5	0	2	3	0

The large and medium sizes can be made adjustable from 29 in. to 34 in., with seats in proportion, at an additional charge of 1s. per desk.

Manufactured by The Educational Supply Association, Ltd.

Adjustable Desks.

Bronze Medal.

To the Educational Supply Association.

The seat and desk portions of this Desk can be adjusted to any height independently of each other, thus enabling the same desk to be used by scholars of any age or height. Owing to the great range in the heights of the desks, viz., from 27½ in. to 36½ in., the scholars can, if desired, stand at their work. The movements for adjusting the heights are contained in the uprights of the desk and seat respectively, the uprights, including the adjustable movements, being made of iron. The movements work automatically, there are no springs to get out of order, and the desk and seat can be securely fixed at each height by means of a pin attached to the upright by a steel chain.

Manufactured of pitch pine 3 ft. 6 in. long. The whole of the writing portion forms a movable flap, and consequently an unbroken surface is available for writing. The writing portion can also be made flat by means of a pin that can be inserted in a hole in the hinge, and is attached to the desk by a steel chain. When turned up it forms a bookrest, a suitable ledge being provided. This ledge is also arranged to hold a free arm drawing board. Enclosed bookshelf and slate rack, the whole depth of which is available for storage, no portion of the writing slope projecting below the fixed portion, with back and foot-rail and shaped seat hinged to turn up, thus allowing the edge of the desk to be vertically over the edge of the seat, yet when the seat is tilted ample room is provided for the scholar to stand.

Sizes.—Width of top, 13½ in.; width of seat, 9 in.; height of desk, adjustable from 27½ to 36½ in. at intervals of 1 in.; height of seat, adjustable from 17 in. to 23¾ in at intervals of ¾ of an inch.

Price.—Including bookshelf, *staining and varnishing*, £1 17s. 6d. per desk.

No. 427a.—Similar desk to above but with fixed top, £1 15s. per desk.

Manufactured by The Educational Supply Association, Ltd.

Dual Desk, hinged for floor cleaning (PATENTED IN ENGLAND).

Bronze Medal.

To P. Johannes Mueller.

The great advantage of the Rettig system is the hinged arrangement of the school benches, thereby affording an easy method for the cleansing of the floors. The Rettig system can be applied to any kind of form or bench, and by means of the arrangement the floor can be exposed strip by strip.

Manufactured by P. Johannes Mueller, London and Berlin.

The "Scholars" Simplex Stand for fixing to any make of desk.

Bronze Medal.

To the Magazine Holder Co.

Sizes.—Base 6 in. long by 3 in.; holder 12 in.

Price.—£1 per dozen (complete).

Parts.—Divided into two parts, standard and holder.

Manufactured by Magazine Holder Co., 180, Cardigan Road, Leeds.

Adjustable Desk for Girls, with movable table for needlework.

Bronze Medal.

To The School Furniture Manufactory.

Adjustable Normal-School-Desk, may be adjusted to suit for pupils of any age and height. The desks are provided with iron frame, removable table-board, swinging seats acting perfectly noiseless, sills of ⊓ iron with hardwood fillings. Desk, seat, and back are apart, and therefore may be adjusted independently of each other. This model is suitable for such schools where the attendance in the different classes varies.

Price.—Two seats, £2 2s.

Manufactured by The School Furniture Manufactory, Kaiserslautern.

Metal Lockers.

Bronze Medal.

To Merritt & Co.

Expanded Metal and Sheet Steel Lockers, suitable for schools, large workshops, etc. Each Locker fitted with shelf and hooks, and different lock and key, and a master key to fit the whole suite.

Sizes.—Can be made in any size, but 12 in. by 12 in. by 60 in. high, are most popular.

Price.—18s. each for either type, expanded metal or all sheet steel finished in enamel.

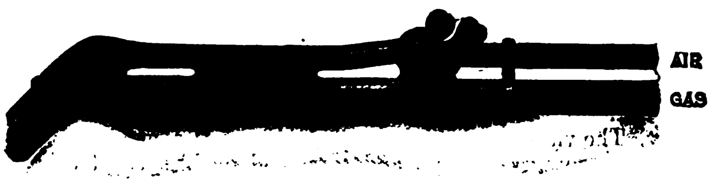
Parts.—About 17s. each for a quantity.

Manufactured by Merritt & Co., 8, White Street, Moorfields, E.C.

Laboratory and Workshop Appliances for use with gas.

Bronze Medal.

To Fletcher, Russell, & Co.



Gas-heated Muffle Furnace, for assaying, hardening, tempering and enamelling Interior sizes from 2 in. by 2 in. by 2 in. to 42 in. by 30 in. by 10 in.

Prices from £3 17s. 6d. to £50.

Gas Blow-pipes for brazing, soldering, &c. Sizes $\frac{3}{8}$ in. to $1\frac{1}{2}$ in.

Prices.—5s. 3d. to £2 13s.

Water-heaters for Laboratories and Lavatory Basins. Sizes 14 in. by 6 in.

Price.—£1 10s.

Manufactured by Fletcher, Russell, & Co., Ltd.

Pupil-Mechanic's Fitting Bench, with parallel vice.

Bronze Medal.

To T. J. Syer.

This Bench has a detachable file rack and divisions provided for accommodation of all necessary tools. One half of the table, being plain, is used for marking out purposes, the other is provided with compartments covered by a hinged lid, which holds the drawing board with the drawing attached, whilst marking out. The vice table having a separate compartment for each tool (named if necessary) encourages tidiness and care, and enables the teacher to see at a glance if any tool is missing or requires attention. A swing seat enables the student to rest whilst marking out, etc., and is easily put out of the way when not required.

Patentees, and Manufactured by, Thos. J. Syer & Co., Finsbury, E.C.

The "A. L." Spectrum Colour Scheme by Florence Kirk.

Bronze Medal.

To E. J. Arnold & Son, Ltd.

A system of colour instruction, based on the six colours of the solar spectrum —red, orange, yellow, green, blue, violet (indigo being omitted as a tint intermediate between blue and violet). The six spectrum colours, in as pure a quality as possible, are used as standards, and, in addition, a darker *shade* and four graduated lighter *tints* of each colour are introduced in various parts of the scheme. The scheme includes:—(*a*) Educational Handwork and Systematic Colour Instruction based on the Spectrum, a Practical Guide for Teachers; net 5s. (*b*) Complete sets of materials, aids, and specialities for definite and systematic instruction in many branches of Educational Handwork (for prices see illustrated list, post free).

Size.—Educational Handwork, crown 4to ($7\frac{1}{2}$ in. by $9\frac{1}{4}$ in.), 196 pp.

Price.—Educational Handwork, 5s. net. Materials, various prices.

Manufactured by E. J. Arnold & Son, Ltd., Educational Publishers, Leeds and Glasgow.

Hygienic Educational Diagrams.

Bronze Medal.

To E. J. Arnold & Son, Ltd.

The "A. L." Health Diagrams, treated on a physiological basis, by Miss Alice Ravenhill, F.R.San.I., and Miss E. M. Morris. The object of these diagrams is to facilitate instruction in the laws relating to the care of the body. They emphasize, by the use of bold drawing and colouring, certain simple physiological facts, without emphasizing those anatomical details which often prove somewhat repulsive, and are generally confusing to the young student of physiology, and which do not, in the early stages of the study, serve any useful purpose.

Size.—Each diagram 42 in. by 33 in.

Price.—The set of six, C.R.N., £1 2s.; or mounted under one top-lath, 10s. 6d. Each chart, singly, 4s.

Manufactured by E. J. Arnold & Son, Ltd., Educational Publishers, Leeds and Glasgow.

Systematised Colour Instruction and Materials for Teaching Young Children.

Bronze Medal.

To Joseph W. Lovibond.

A Series of Nine Circles on cards coloured to represent the six-colour ray theory of white light, and their division into two groups.

A Set of Eighteen Graded Glass Standards in Permanent Colours to demor-strate the theory.

A Frame with Nine Apertures to show the the Coloured Strndards as Transparencies.

A Whitened Tray to show them as Opaque Colours.

A Descriptive Card for the use of Teachers.

Size.—11½ in. by 10 in.

Price.—£1 10s.

Manufactured by The Tintometer, Ltd., Salisbury.

Lithofalt.

Bronze Medal.

To The Limmer Asphalte Paving Co., Ltd.

Mineral Lithofalt Asphalte is a patent paving, which may be laid as mastic *in situ*, or in the form of blocks, 9 in. by 4½ in., in thicknesses of 1 in., 1½ in., or 2 in., with either plain or grooved surface.

Sizes.—9 in. by 4½ in.; 1 in., 1½ in., or 2 in. thick.

Price depends upon quantity and locality.

Manufactured by The Limmer Asphalte Patent Paving Co., Ltd.

First Aid Diagrams.

Bronze Medal.

To F. E. Wachsmuth.

Six diagrams (in colours) illustrating the method of procedure in cases of accidents.

No. 1. Ohnmacht, Hitzschlag, Krämpfe.
„ 2. Blitzgefahr, elektrischer Schlag.
„ 3. Armbruch.
„ 4. Blutvergiftung.
„ 5. Ertrinken.
„ 6. Blutungen.

Size.—88 : 66 cm. (35 by 27 in.)

Price.—Mk. 1.40 each.

Manufactured by F. E. Wachsmuth, Leipzig.

Educational Gymnastic Outfits.

Silver Medal.

To Spencer, Heath, & George.

Wall Bars or Ribstolls, price per single section, £1 5s.; for not less than 5, per section, £1 1s.——Double Boom, 12 ft. long, portable and adjustable, £5 12s. 6d.——Single Boom, portable and adjustable, £3 17s. 6d.——Forms, 9 ft. long, fitted with underbrace for balancing practice.——Horizontal or vertical Swedish ladders, £4 19s. 6d.——Climbing Ropes, per ft. run, 10d.——Jumping Board, 7s. 6d.——Jumping Stands, 12s. 6d.——Mats, per square foot, 1s.——Vaulting Horse, adjustable legs, and ring pommels, £7 10s.————Measuring Machines, from £3 17s. 6d. to £5 10s.——Chest Calipers, £1 15s.——Spirometer, graduated in cubic inches, £2 10s.

Manufactured by Spencer, Heath, & Co., Goswell Road, E.C.

Chaddock Reversible and Locking Window Fittings.

Silver Medal.

To the Chaddock Mechanical Window Co., Liverpool.

Changeable School Benches.

Bronze Medal.

To Herr M. Alajos, Budapest.

Anatomical and Physiological Diagrams.

Bronze Medal.

To C. C. Meinhold and Sons, Dresden.